GENERAL STUDY OF IRRIGATION AND RECLAMATION PROBLEMS

HEARINGS

BEFORE THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS
HOUSE OF REPRESENTATIVES

EIGHTY-SECOND CONGRESS

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GENERAL STUDY OF IRRIGATION AND RECLAMATION PROBLEMS

MONDAY, FEBRUARY 12, 1951

HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met at 10 a. m. in the committee room of the House Committee on Interior and Insular Affairs, the Honorable John R. Murdock (chairman), presiding.

The CHAIRMAN. The committee will come to order, please.

It is our custom at the opening of each session to devote some preliminary time to a survey of the work ahead for the committee. I notice this study is called in the Senate, as it was by my predecessor, a sort of seminar, but I have a dread of seminars, so I do not like to use that expression. I see that some of you know the reason why I have a dread of seminars.

I had thought that we might have several days to devote to a general study, before the reference of any bills to subcommittees for consideration. I do not know but what that is a good practice, even if it were not the former practice of this committee and the Senate committee which corresponds to ours.

At the opening of the Congress each year, according to the Constitution, the President is called on and expected to give a message outlining the things as he sees them from his standpoint. What Congress does with the message is something else, yet, of course, it is all a part of the legislative process under our institutions.

I thought today that we might make a beginning. I had scheduled Tuesday for the Park Service, to continue their work, and the work of education, so to speak, by presenting some pictures along with their story. In view of the fact that we have to set up some machinery for that sort of thing I did not feel we could make any change, although it might be appropriate to do so. Perhaps our attendance will be better, and on Tuesday we will have the Park Service here to present pictures, slides, views and that sort of thing illustrating the work of the Park Service.

Mr. D'EWART. Mr. Chairman?

The CHAIRMAN. Yes, Mr. D'Ewart.

Mr. D'EWART. During these reviews was it your thought to have Mr. Cook, the chairman of the present Water Resources Board, before us, in order to get his views?

The CHAIRMAN. I think possibly Mr. Engle had that in mind, or something like that, in the Subcommittee on Irrigation and Reclamation. It would be appropriate for the full committee also, of course.

Mr. D'EWART. We have to give thought to those matters.

The CHAIRMAN. That is right.

Mr. D'EWART. I have six bills.

The CHAIRMAN. Those bills, of course, will be referred to that particular subcommittee. It would pinpoint the views a little better before that committee.

In connection with the pictures and that sort of thing I want to remind the committee that we have a whole library of films. I very proudly displayed one to the committee at the last session. I have that film—I am afraid I sneaked out a copy, and there were a limited number at that—which is on Arizona.

However, I have recently seen some other films, produced by the Bureau of Mines at the expense of some great donors. The Arizona picture was produced by the Bureau of Mines and paid for by the Phelps-Dodge Mining Co., although you will recall that less than 30 percent of the views pertained to mining.

There are available some more recent State pictures. There is one of Texas, for instance. I am sure that Mr. Regan would say we ought to see that. It is a great film on Texas. It is ours for the asking. It is highly educational.

There is a great film on Nevada, and there is one on Wyoming, and I understand there is one on Missouri, though I have not seen it. All of these films are available, and with your permission I am going to arrange that they be shown us by the Library of Congress. They will be borrowed from the Bureau of Mines. On Tuesday we have the National Park Service present their study.

On Wednesday we want to continue with the general work, which we shall begin today, on water resources and that sort of thing. This will chiefly be by the Reclamation Division of the Department of the Interior.

Now, before going to our other work, we have a full staff and we want to make full use of them. In addition to that staff I have insisted that we make full use of Dr. Mahoney, who is the senior specialist in the Library Reference Service. We have already used him to good advantage, and I hope to use his services to an even greater advantage.

Each one of you has been supplied with this document, No. 706, and you find it on your desks, a House document of the last Congress.

Late last year there were two bills introduced on related subjects. One was H. R. 6257, water resources basic data program, introduced by myself; and another was H. R. 6900, an accelerated surveying and mapping program which was introduced by Chairman Peterson. Hearings were held on these bills. The bills were reported out by the committee last year, in the last Congress. These hearings are available. The clerk informs me that each member has been supplied with a copy of them.

I reintroduced both bills this year, though slightly changed. To that change I called attention at the last meeting, I believe. I do not know when Congressman Engle will take up the one, or when Congressman Bentsen will take up the other for action, but perhaps it will be soon.

A glance at this House document, which is House Document No. 706, Eighty-first Congress, second session, dated November 1950, entitled "A Program to Strengthen the Scientific Foundation in

Natural Resources" gives some idea of the extent of the jurisdiction or field of operation of this committee. This ought to be carefully studied, because several of the divisions in the Department of the Interior have had a hand in accumulating this material. However, I find that when I want information it is sometimes difficult to get that information, although an agency has been established for a century or a half century to accumulate the information. There are many questions I would like to ask of the Weather Bureau, and I can ask but sometimes they are not adequately answered. The question then is "Why?" What has the Weather Bureau been doing all these years?

There are questions I would like to ask of the Geological Survey. I can ask, but I do not always get an adequate answer.

I have even had trouble getting modern topographic maps. It is an actual fact that I have asked for maps of my part of the country and I have been supplied with maps which were prepared by Major Powell about the time I was kicking the slats in the crib.

Now, the purpose of these two measures that have been reintroduced, of course, is to strengthen the scientific foundation. It will call for more effort, more knowledge, so that we may legislate better. We have the report of the President's Resources Commission. I think the last issue is just about out. We must give it study.

I was talking with Dr. Mahoney a few days ago, and he tells me that he is in touch with scientists, and university men, who delve into these matters to a greater extent than we have been accustomed to do heretofore. We cannot do it now, but I am asking Dr. Mahoney to accumulate all the scientific information he can. Perhaps at some time we will be able to call in some of these eminent men, if they are in nearby universities, and have them as witnesses.

I am asking Dr. Mahoney to accumulate statements of these men, so that we may have them for the consideration of the committee.

This is an atomic age. We have learned a lot about Nature that we did not know 6 or 7 years ago. We spent a whale of a lot of money learning it, and in a way we had to learn it the hard way. I doubt not but that there is new scientific information which this committee ought to have as a background of knowledge for the wisest kind of legislation. We want to delve into that, but we will not take more time on it at this moment.

It is my hope that we may have at least one, and perhaps two more House documents, of which House Document No. 706 is the beginning. In general we have dealt with surface water flowing in streams and have been giving too little attention to underground water, which is equally important. Another study which ought to be engaged in is the relation of both land and water to climate, particularly sunshine and radiant energy. Much is being discovered with regard to photosynthesis which depends so largely upon the radiant energy of the sun in production of food and fiber. I for one would like to trace the connections between land, water, and radiant energy.

I notice that the clerk has handed out a great amount of material. If you are burdened with this it is because I asked the Department to furnish it, as is usually the case at the beginning of a session. This pertains to irrigation and reclamation chiefly. We are expected to study this for the rest of the year.

In addition, I have asked Mr. Lineweaver, in the absence of the Commissioner, to come before us this morning and open up our discussion with regard to this matter.

Mr. Lineweaver, this is in answer to a letter which I wrote the Department asking for a kit of material, hoping that you or the Commissioner himself would come up to make some preliminary remarks.

Mr. ASPINALL. Mr. Chairman, I suggest that the members at the lower end of the committee rostrum be allowed to sit out of order.

The CHAIRMAN. That is perfectly satisfactory. Would you gentlemen please move in a little closer.

Now, Mr. Lineweaver, I take it that this kit of material indicates reclamation projects in the several classes. Of course, right now we are interested in the matter of appropriations, but I take it that this is not quite the function here this morning to deal with that, except to treat the reclamation program as you see it.

STATEMENTS OF GOODRICH W. LINEWEAVER, ACTING COMMISSIONER, BUREAU OF RECLAMATION; AND WESLEY R. NELSON, ASSISTANT COMMISSIONER, BUREAU OF RECLAMATION

Mr. LINEWEAVER. Yes, sir.

The CHAIRMAN. So that we may be informed and especially heartened in our efforts.

Mr. LINEWEAVER. Mr. Chairman, so that the members of the committee will have some idea as to the way we thought about presenting this matter, may I say that several weeks ago, in accordance with the custom of the chairman of the former Committee on Public Lands and the chairman of the subcommittees, we followed the usual procedure. Each year as Congress convenes a letter is sent to the Commissioner requesting that the members of this committee as well as all western Members of Congress be advised as to the analysis of the President's budget estimates with respect to reclamation.

In response to that request—and I will submit the correspondence for the record, but not the material—we distributed to the members of the committee and the western Members of Congress and the members of the Appropriation Committee at their request a compendium of information on the President's budget estimates relating to reclamation, which are entitled, "Summary Statements of Work Proposed for Fiscal Year 1951 in the President's Budget as Transmitted to the Congress."

(The correspondence is as follows:)

COMMITTEE ON THE PUBLIC LANDS,
HOUSE OF REPRESENTATIVES,
Washington, D. C., January 12, 1951.

G. W. LINEWEAVER,
Assistant Commissioner, Bureau of Reclamation,
Department of the Interior,
Washington, D. C.

DEAR MR. LINEWEAVER: Last January, you will recall, I requested your Bureau to furnish myself and other members of the Public Lands Committee statements on the items included in the Bureau's phase of the President's budget for the fiscal year 1951. This was done and I feel the information furnished was highly informative to the members.

Would it be possible for you to furnish this same information this year in connection with the budget estimates for the fiscal year 1952? I believe this information should include not only construction items on each project or unit but also operation and maintenance, general investigations, administrative expenses, and other items contained in the budget.

Since many Representatives in Congress from the Western States, who are not members of the Public Lands Committee, frequently ask about specific items in the reclamation budget, it might also be well to furnish them with this same material stating that it is being furnished at my request.

Thanking you for your cooperation, I remain

Sincerely,

JOHN R. MURDOCK, *M. C.*

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D. C., February 6, 1951.

Hon. JOHN R. MURDOCK,
House of Representatives,
Washington, D. C.

MY DEAR JOHN: The following letter has been sent to committee members as well as all western Congressmen in response to your letter of January 12:

"Chairman John R. Murdock of the House Public Lands Committee, as shown by his letter of January 12, has requested that members of the House Public Lands Committee as well as all western Congressmen be furnished factual statements on the items in the Bureau of Reclamation's section of the President's budget for the fiscal year 1952.

"Enclosed are concrete statements and tabulations of the reclamation program as reflected in the President's budget.

"For reference to construction and rehabilitation items relating to projects in a particular State, a table of contents, arranged by States, is found on page I. General statements of Bureau-wide activities relating to general investigations, operation and maintenance, general administrative expenses, and emergency funds are shown at the end of the table of contents under 'Various States.' In addition, another table of contents is on page VI arranged by appropriation items.

"If you should desire further information, the Bureau of Reclamation will be pleased to furnish additional data."

Sincerely yours,

G. W. LINEWEAVER, *Acting Commissioner.*

Mr. LINEWEAVER. We feel that perhaps this hearing might very well have as a background a synopsis which is tabulated of the budget estimates, together with the appropriations made for fiscal year 1951. This tabulation will show the budget estimates for 1951 as sent up by the President, the appropriations made by the Congress for fiscal year 1951, the reductions under section 1214 of the general appropriations bill which authorized, as you recall, the Director of the Budget to make reductions aggregating not less than $550 million. Then the tabulation shows the net appropriations for 1951 after the reductions under section 1214, and the last column shows the budget estimates for fiscal year 1952 as contained in the President's budget message.

I will submit that for the record.

(The document is as follows:)

Bureau of Reclamation—Statement of appropriation, fiscal year 1951 and estimate of appropriation, fiscal year 1952

Appropriation and activity		Fiscal year 1951				Fiscal year 1952, budget estimate
		Budget estimate	Appropriation	Reduction under sec. 1214	Net appropriation	
General investigations		$7,800,000	$5,875,000	$375,000	$5,500,000	$5,500,000
Construction and rehabilitation		[2] 327,066,500	[2] 296,928,000	53,195,000	243,733,000	223,690,000
Allotments:						
Alaska	Eklutna	1,100,000	1,100,000		1,100,000	5,761,400
Arizona	Gila	6,508,000	6,208,000		6,208,000	6,870,000
Arizona-California	All-American Canal	4,662,000	1,874,000		1,874,000	180,000
	Colorado river front work and levee system	1,000,000	950,000	500,000	450,000	2,445,000
Arizona-Nevada	Boulder Canyon	6,600,000	6,100,000		6,100,000	2,900,000
	Davis Dam	14,320,000	13,620,000	6,869,541	6,750,459	8,072,000
California	Central Valley	49,513,000	43,063,000	13,589,473	29,473,527	38,350,000
	Cachuma	8,359,000	7,417,500	226,000	7,191,500	11,150,000
	Kern River					75,000
	Kings River					12,000
Colorado	Colorado-Big Thompson	21,700,000	21,000,000	2,000,000	19,000,000	19,300,000
	Paonia	1,057,000	1,000,000	454,528	545,472	186,000
	San Luis Valley	1,839,000	1,839,000		1,839,000	622,800
Idaho	Boise-Payette	204,400	204,400	204,400		154,200
	Minidoka-American Falls power					1,300,000
Montana	Buffalo Rapids, first division	160,000	160,000	6,382	153,618	200,000
	Buffalo Rapids, second division					77,000
	Fort Peck	1,743,000	1,093,000		1,093,000	1,693,000
	Hungry Horse	30,500,000	29,500,000	2,975,374	26,524,626	22,972,000
	Milk River, Fresno Dam	40,800	40,800		40,800	
	Sun River	54,000	54,000	27,436	26,564	40,400
Nex Mexico	Fort Sumner	1,681,000	1,681,000		1,681,000	64,000
	Tucumcari	174,000	174,000	88,399	85,601	244,000
New Mexico-Texas	Rio Grande	1,091,000	1,041,000		1,041,000	1,088,000
Oklahoma	W. C. Austin	263,000	263,000		263,000	135,000
Oregon	Deschutes, north unit	500,000	500,000	321,577	178,423	313,700
Oregon-California	Klamath	940,000	890,000	156,274	733,726	434,400
Utah	Provo River	4,596,000	4,396,000		4,396,000	2,748,000
Washington	Columbia Basin	53,500,000	49,500,000	5,409,872	44,090,128	27,900,000
	Yakima, Roza	225,000	225,000		225,000	48,600
Wyoming	Eden	206,000	206,000		206,000	2,000,000
	Kendrick	1,000,000	950,000		950,000	2,575,000
	Riverton	3,358,000	3,200,000	410,520	2,789,480	1,000,000
	Shoshone	115,000	115,000	115,000		204,300
Various	Missouri River Basin [4]	[3] 105,057,300	[3] 95,563,300	19,840,224	75,723,076	58,673,600
	Rehabilitation and betterment of existing projects	5,000,000	3,000,000		3,000,000	3,900,000
Operation and maintenance		17,752,000	15,491,000	44,200	15,446,800	16,385,000

Operation and maintenance		17,752,000	15,491,000	44,200	15,446,800	16,385,000
Allotments:						
Arizona-California	All-American Canal					291,000
	Colorado river-front work and levee system	935,300	935,300		935,300	1,073,000
	Parker-Davis	2,999,600	2,999,600		2,999,600	2,545,600
	Yuma	760,700	189,700		189,700	255,800
Arizona-Nevada	Boulder Canyon	1,808,000	1,808,000		1,808,000	1,671,000
California	Central Valley	2,058,500	2,017,200	44,200	1,973,000	2,364,990
	Orland	83,200				
Colorado	Colorado-Big Thompson	608,500	608,500		608,500	740,300
	Mancos	3,100				
	Pine River	6,100				
Idaho	Boise	333,700	315,900		315,900	404,000
	Minidoks	473,100	326,200		326,200	316,900
Montana	Milk River	81,850				
	Missoula Valley	4,140				
Nebraska	Mirage Flats	26,600				
Nebraska-Wyoming	North Platte	339,750	259,750		259,750	231,600
New Mexico	Carlsbad	8,150				
New Mexico-Texas	Rio Grande	1,118,750	276,100		276,100	721,100
Oklahoma	W. C. Austin	99,800				
Oregon	Deschutes	190,400	190,400		190,400	180,000
	Umatilla	8,800				
	Vale	4,390				
Oregon-California	Klamath	544,600	329,600		329,600	329,600
Oregon-Idaho	Owyhee	381,600	381,600		381,600	460,000
South Dakota	Belle Fourche	6,140				
	Rapid Valley	5,340				
Texas	Balmorhea	5,740				
Washington	Columbia Basin	2,327,500	2,327,500		2,327,500	2,416,600
	Yakima	454,900	454,900		454,900	515,600
Wyoming	Kendrick	591,700	591,700		591,700	568,600
	Riverton	294,450	294,450		294,450	257,860
	Shoshone	441,300	438,300		438,300	284,350
Various	Soil and moisture conservation operations	746,300	746,300		746,300	757,100
General administrative expenses		7,800,000	7,200,000	336,000	6,864,000	6,000,000
Emergency fund, irrigation and power system						500,000
Appropriation or estimate		360,418,500	325,494,000	53,950,200	271,543,800	252,075,000
Permanent appropriations:						
Payments to States of Arizona and Nevada		600,000	600,000		600,000	600,000
Repayment of interest on advances from the Treasury		4,500,000	4,500,000		4,500,000	4,500,000
Continuing fund, Fort Peck project, Montana		402,086	402,086		402,086	400,000
Permanent appropriations		5,502,086	5,502,086		5,502,086	5,500,000
Total appropriation or estimate, including permanent appropriations		365,920,586	330,996,086	53,950,200	277,045,886	257,575,000

[1] See attached statement for breakdown of Missouri River Basin project.

[2] Excludes $3,000,000 contracting authority granted in the 1951 Appropriation Act for construction of transmission lines and substations in South Dakota. This amount was withheld by Budget Bureau under sec. 1214 of the Appropriation Act, 1951.

NOTE.—In addition, the Budget of the United States, 1952, includes the following proposal for later submission: "*Hells Canyon power project, Bureau of Reclamation.*—It is proposed to initiate construction on this project in fiscal year 1952 if authorized. An amount of $8,000,000 is included in the budget as an estimated 1952 supplemental appropriation."

Bureau of Reclamation—Statement of appropriation, fiscal year 1951 and estimate of appropriation, fiscal year 1952—Continued

MISSOURI RIVER BASIN PROJECT

Division	State	Unit	Fiscal year 1951				Fiscal year 1952, budget estimate
			Budget estimate	Appropriation	Reduction under sec. 1214	Net appropriation	
Phase A—Units ready for or under construction:							
Big Horn Basin	Wyoming	Owl Creek	$1,544,000	$1,544,000	$899,500	$644,500	
Bostwick	Nebraska-Kansas		4,000,000	4,000,000		4,000,000	$1,982,300
Boysen	Wyoming	Boysen	7,142,600	7,142,600	900,000	6,242,600	1,958,060
Cannonball	North Dakota	Cannonball	46,000				
Cheyenne	Wyoming-South Dakota	Angostura	1,661,000	1,361,000	699,000	662,000	1,261,900
		Keyhole	3,179,000	3,179,000	2,305,716	873,284	1,282,700
Frenchman-Cambridge	Nebraska		11,532,000	11,532,000	1,000,000	10,532,000	8,400,018
Grand	South Dakota	Shadehill	2,477,000	2,147,800	262,000	1,885,800	506,000
Heart	North Dakota	Dickinson	258,700	150,000	100,000	50,000	11,000
		Heart Butte	753,000	753,000	411,611	341,389	509,000
Helena-Great Falls	Montana	Canyon Ferry	6,800,000	5,800,000	1,704,559	4,095,441	8,078,000
Lower Big Horn	do	Yellowtail	208,000	208,000		208,000	
Marias	do	Lower Marias	5,473,000	4,740,000	4,739,944	56	
Missouri-Souris	Montana-North Dakota	Jamestown	105,000	750,000	750,000		
		Missouri Diversion	1,462,000	1,000,000	1,000,000		
Montana Pumping	Montana	N-Bar-N					
Moreau River	South Dakota	Bixby	528,000				
North Dakota Pumping	North Dakota	Fort Clark	254,000	254,000		254,000	102,000
Oregon Trail	Wyoming	Glendo	150,000	150,000		150,000	300,000
		Kortes	698,500	698,500		698,500	
Smoky Hill	Kansas	Cedar Bluff	7,119,000	7,119,000	300,000	6,819,000	1,310,141
South Platte	Colorado	Narrows	3,850,000	810,600	677,697	132,903	75,000
Three Forks	Montana	Crow Creek	130,000	116,000	108,477	7,523	100,000
Transmission			20,132,000	20,557,000	1,121,592	19,435,408	18,709,640
Upper Republican	Colorado-Kansas	St. Francis	6,339,000	5,639,000	1,200,000	4,439,000	334,141
Yellowstone	Montana-North Dakota	Cartwright	134,000	134,000	59,841	74,159	33,800
		Sadie Flat	129,000	129,000	101,239	27,761	581,900
		Savage	45,500	45,500	19,727	25,773	
		Sidney	114,000	114,000	114,000		521,000
Subtotal, phase A			86,264,300	80,074,000	18,474,903	61,599,097	46,056,600
Phase B—Units being prepared for construction:							
Big Horn Basin	Wyoming	Big Horn No. 2	39,000	39,000		39,000	15,000
		Big Horn No. 3	24,000	24,000		24,000	14,000
		Bluff	21,000	21,000		21,000	10,000
		Hanover	25,000	25,000		25,000	15,000
		Paintrock					20,000

		Shell Creek	30,000	30,000		30,000	26,000
		Shoshone Extension	300,000	270,000		270,000	250,000
Cheyenne	Wyoming-South Dakota	Rapid Valley	200,000	180,000		180,000	200,000
Columbus	Nebraska	Lower North Loup	703,000	188,185	113,646	74,539	
Helena-Great Falls	Montana	Helena Valley	100,000	75,000		75,000	50,000
James	South Dakota	Oahe	875,000	825,000		825,000	839,000
Jefferson	Montana	East Bench	200,000	100,000		100,000	140,000
Lower Big Horn	Montana-Wyoming	Hardin	292,000	192,000		192,000	300,000
Middle Loup	Nebraska	Farwell	1,297,000	649,792	306,076	343,716	368,600
		Sargent		486,208	254,301	231,907	131,400
Missouri-Souris	Montana-North Dakota	Crosby-Mohall	820,000	770,000		770,000	654,000
		Devils Lake	50,000	50,000		50,000	
Montana Pumping	Montana	Charley Creek	30,000	30,000		30,000	20,000
		Nickwall	10,000	10,000		10,000	14,000
North Dakota Pumping	North Dakota	Hancock	63,500	53,500	15,000	38,500	
		Painted Woods	46,500	36,500	18,000	18,500	
		Square Butte	18,000	18,000		18,000	
Powder	Montana-Wyoming	Kaycee	275,000	250,000	17,000	233,000	67,000
		Moorhead					78,000
		Piney	75,000	65,000		65,000	75,000
Solomon	Kansas	Kirwin					125,000
White	South Dakota	Pine Ridge	50,000				
Yellowstone	Montana-North Dakota	Colgate	6,000	6,000		6,000	20,000
		Elm Coulee	4,000	4,000		4,000	18,000
		Marsh	140,000				
		Seven Sisters	3,000	3,000		3,000	25,000
		Stipek					50,000
Subtotal, phase B			5,697,000	4,401,185	724,023	3,677,162	3,525,000
Phase C—Continuing work on the general plan of development			4,000,000	3,992,115	641,298	3,350,817	3,500,000
Phase D—Work in connection or in cooperation with Corps of Engineers			96,000	96,000		96,000	92,000
Total, Bureau of Reclamation			96,057,300	88,563,300	19,840,224	68,723,076	53,173,600
Other Department of Interior agencies:							
Bureau of Land Management			550,000	550,000		550,000	350,000
Bureau of Mines			200,000	200,000		200,000	200,000
Fish and Wildlife Service			550,000	550,000		550,000	450,000
Geological Survey			6,900,000	4,900,000		4,900,000	3,800,000
National Park Service			400,000	400,000		400,000	350,000
Bureau of Indian Affairs			400,000	400,000		400,000	350,000
Total, other departmental agencies			9,000,000	7,000,000		7,000,000	5,500,000
Total, Missouri River Basin project			105,057,300	95,563,300	19,840,224	75,723,076	58,673,600

Mr. LINEWEAVER. I do not think it is necessary to have the document requested by the chairman in his letter of January 12, 1951, printed in the record, since all the members of the committee and the western members have copies of it.

The general method of presentation which we had discussed this morning was to submit for the record a few statements giving the background of the reclamation program, particularly for the benefit of the nonwestern members of this committee. I believe I am correct in saying that perhaps at this session there are more nonwestern members on what was formerly the Public Lands Committee and which is now the Interior and Insular Affairs Committee of the House than in any recent year. For that reason it might be informative to these new members of the committee to have this background material.

Then after presenting that, Mr. Nelson, Assistant Commissioner, will present the program of the Bureau which was requested by you.

I would like to make this distinction, however, that the relationship between the budget estimates for fiscal year 1952 that are summarized on the tabulation that has been submitted is not related to the program for years beyond 1952 that we are submitting.

In that connection, to give background to the presentation of this program, under date of June 19, 1948, Mr. Richard J. Welch, the late Richard J. Welch, chairman of the Public Lands Committee, requested the Commissioner to submit to the Public Lands Committee a program, a basic 7-year program, that the Bureau and the Department of Interior have under consideration for western water resources and land development.

The program which Mr. Nelson will present to you following the background material will bring up to date the program submitted in 1948 in response to Chairman Welch's request. The material which we will present for the record will include a statement outlining briefly the history of the reclamation program beginning with the enactment of the reclamation law of 1902, which is our Magna Carta. That will deal briefly with the developments from the legislative standpoint over those 49 years.

The next submission will deal with bringing the committee up to date with the irrigation phases from a physical standpoint. That is, that will show the irrigation projects, the lands served and their location, and the investment to date in these physical features.

The next presentation will deal with the record of the crops produced on, or insured by, reclamation projects and as to the wealth created, and in terms of tonnage. In that connection, it may be interesting to state as an introduction to that statement that for the last 3 years the value of crops produced on reclamation projects has in each year exceeded half a billion dollars annually. By way of parentheses, I may state that the other day I had lunch with Dr. Bennett, president of the Oklahoma Agricultural and Mechanical College, who is now the head of the point 4 program in the State Department.

Dr. Bennett emphasized that the crops produced on reclamation projects as well as all other agricultural production represents an increase in the wealth of the Nation. He took us somewhat to task for not emphasizing that phase of the crop production under reclamation projects which represents wealth created on land transformed from desert and sage brush into productive farms and ranches. We told him that we would try to correct that deficiency.

The CHAIRMAN. That is what I was going to ask you to correct, or to give us more fully or rather fully.

Mr. LINEWEAVER. That is what I have in the statement here, Mr. Chairman. Then the balance of the reclamation program is the reclamation power operations particularly with respect to the present installations and those authorized.

Reclamation now has in operation projects with something like an installed capacity of 3,500,000 kilowatts. That is the largest installations, or those are the largest installations, the total, under any one agency in the Federal Government or under private management. That list will be submitted for the record.

It also shows the number of authorized installations which when completed will increase the total to something like 7,500,000 kilowatts. Included in that 7,500,000 will be some 1,400,000 kilowatts that will be installed by the Corps of Engineers in the Missouri Basin, but from which the power will be marketed by Reclamation under the Flood Control Act of 1944.

Prefacing the power information will be a statement showing the revenues from power which in 1950 approximated $35,000,000, or an increase of about 12½ percent over the 1949 figure.

The next statement will deal briefly with the relationship of irrigation and power physically and financially and with the policy with respect to aid to irrigation from power revenues. I will not go into details on that at this time, except to say that the program of the Department and of the Bureau of Reclamation which has been approved by Congress provides for substantial aid to irrigation developments from power revenues.

The statement will show what the amount of aid has been to date and what is contemplated under the authorized program.

Perhaps of interest to both the western and nonwestern members is a statement or statistics on the domestic market that reclamation projects have created and maintained for nonwestern manufactured products. Over the years, beginning in 1939, we have used the Boise area and the Minidoka area, in Congressman Budge's district, as sort of pilot areas to show the volume of products from the non-Western States as well as the value of these projects that have been shipped into these particular areas over the years.

The comparisons of the values, of course, from 1939 to 1949, are especially striking. We have used the Idaho areas particularly, because Idaho is an area where irrigation transformed the desert or sagebrush land into highly productive farms that support areas and cities and towns like Boise and Twin Falls in the Minidoka area.

We are bringing this material up to date and will submit it for the record, Mr. Chairman.

Then we have checked those figures by other areas in the West, where the railroads have cooperated in showing the volume and value of incoming shipments from areas outside of the West.

In that connection, I may interpolate for a moment by saying that 2 years ago, at the conclusion of our hearings before the House Appropriations Subcommittee on Interior, Chairman Kirwan of Ohio made this remark as a result of some discussions about why he was supporting reclamation: He said it was a matter of dollars and cents that the more reclamation developments in the West the more customers that were created, the more wealth that was built up

through reclamation developments the more washing machines and other products of the factories in the Youngstown area were shipped westward.

That may be considered a relatively minor part of the shipments to the western reclamation market, but at the same time it is significant of the understanding of reclamation by nonwestern Members of Congress who have had the opportunity to familarize themselves with the national significance of this development.

The CHAIRMAN. I do hope that that is brought out, the interdependency of the various parts of our country—and ours is a big country—each section dependent upon each other and that mutual and profitable interplay of commerce.

Mr. LINEWEAVER. I think you will find, Mr. Chairman, over the years that some of the strongest supporters of reclamation in the nonwestern areas have been the representatives from industrial districts who have been advised by the executives of their industrial developments of the market that has expanded in the West through not only the Federal reclamation developments, but by the private irrigation developments as well.

In normal times the domestic market has a greater significance than some of us sometimes appreciate.

The CHAIRMAN. Before you conclude that statement, I wish that you would not only stress the production, crop production, but I would like for you to say something about the further expansion of the West, the growth in population and the servicing of that increased population on the spot, too.

Mr. LINEWEAVER. Yes, sir. We have that in mind, Mr. Chairman. I have one or two other statements here, just along the line that you have indicated.

The population problem is one that has attracted considerable attention. We have been greatly impressed by it, and our attention has been repeatedly called to the trend in population from 1940 to 1950. While the population of the country as a whole increased from 131 to 150 million, or 14.3 percent, the 11 Western States which are almost wholly dependent on irrigation increased from 13.8 to 19.3 million, or 39.6 percent.

The 17 States in the western irrigation group over the same decade have increased from 27 to 33 million, or 24.9 percent.

I will submit for the record a population tabulation which reveals those figures in detail by States.

Mr. D'EWART. Mr. Chairman, I wonder if that shouldn't be broken down without California, because a larger percentage of that increase is industrial in California and not due to irrigation development.

Mr. LINEWEAVER. Yes sir; that is true, Mr. D'Ewart. We can bring that out in the statement. Those give the high spots of the statement.

May I make this observation in connection with Mr. D'Ewart's comment just now: The increase in the industrial population in California, Washington, and Oregon, has correspondingly increased the demand for agricultural products in those areas, which is an important factor in that connection. I did not mean to imply that the entire growth in population was due to the irrigation development, but to illustrate that the increase in population requires production closer to the seat of consumption.

Chairman MURDOCK. I would like to ask a few questions that will bring out the statements that you referred to so that the record will show the emphasis that should be placed on the points that you have mentioned.

Mr. LINEWEAVER. My first statement will outline briefly the history of the reclamation program from the enactment of the Federal reclamation law, signed by the late Theodore Roosevelt on June 17, 1902. The reclamation law has been amended and elaborated on many times by the Congress until the Federal reclamation laws cover a volume of 766 pages, with a supplement of 146 pages up to 1946. None of these amendments or elaborations have changed the basic principles on which the reclamation program was founded nor the objectives which have consistently been directed toward the full development of family-size farms together with hydroelectric-power production not only to aid in western progress but to assist irrigation. Incidentally, it may be of interest to the committee to know that the reclamation program is and will continue to be adequately balanced by the irrigation and power development with related multiple-purpose functions, such as flood control, recreation, fish and wildlife protection, and so forth. I am submitting a more elaborate statement for the record.

(The statement is as follows:)

HISTORY OF RECLAMATION

Nearly a half century has elapsed since President Theodore Roosevelt signed the bill which created the Federal reclamation program. On June 17, 1902, the Secretary of the Interior was authorized, through the Reclamation Service, now the Bureau of Reclamation, to undertake a program of water conservation and utilization through which the water and land resources of the arid West could be developed.

Reclamation's primary purpose was and is irrigation. As the program has unfolded, however, the opportunity for multiple-purpose development has been recognized by the Congress and the reclamationist alike. The projects Congress authorize and the Bureau build are oriented therefore in terms of the greatest service to the greatest number of people and the greatest variety of uses, consistent with the optimum use of the resource developed. Additional benefits accuring through multiple-purpose and river-basin developments have been realized in the fields of hydroelectric power, flood control, navigation, domestic and industrial water supplies, salinity control, silt control, recreation, and fish and wildlife propagation and preservation. Comprehensive western development through the purposes indicated have made tremendous contributions to the Nation as a whole through the defense and war efforts of this Nation since 1902.

The establishment of Federal reclamation as an affirmative national policy actually began before the passage of the Reclamation Act and started with the Powell irrigation survey of 1878. This survey of the arid region of the western United States was made by Maj. J. W. Powell, in charge of the geographical and geological survey of the Rocky Mountains. In his report which was submitted to the Congress on April 3, 1878, Major Powell recommended the development and utilization of the arid public lands west of the one hundredth meridian, to be implemented by the enactment of a general law to permit the settlement of such lands in family-size units under the homestead laws, and settlers to organize themselves into local irrigation districts. The Congress authorized the continuation of the Powell survey in 1879 and, in the same year, by the act of March 3, 1879 (20 Stat. 377, 394), established the Geological Survey in the Interior Department with direction to classify all the public lands and to examine the geological structure, mineral resources, and products of the national domain.

The Reclamation Act of June 17, 1902, authorized the Secretary of the Interior to investigate, construct, and operate Federal reclamation projects. The construction costs were to be repaid by the water users on the projects in 10 annual installments. Where public lands were involved, they were to be governed by applicable homestead laws but in no event were they to be homesteaded in tracts of more than 160 acres. The reimbursability concept has remained intact.

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However, from time to time, Congress has seen fit to amend the law to provide for the recovery of construction charges over periods of time greater than 10 years and now, generally, 40 years with annual payments equated to the water user's ability to pay.

The family size farm, which was the basis of the original Federal Reclamation Act, is still the basic unit of the reclamation program. Under this fundamental concept, nearly 100,000 family-size farms have been, or are being made available in the 17 Western States of Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming. Wherever these family-size farms are located on public land, priority in their disposal is given to the country's veterans.

These 100,000 farmers who cultivate 5,678,000 irrigable acres produce a tremendous variety of crops, including dates, nuts, figs, citrus fruits, deciduous fruits, vegetable and truck crops, and all manner of feed, forage, and field crops. A very high percentage of the foods that we have grown to prize so highly are produced on western irrigated farms, an appropriable number of which are irrigated through the reclamation program. Among these crops are dates from the Imperial and Coachella Valleys, avocados and fine citrus from southern California, Arizona, and Texas, choice apples from the Pacific Northwest, and a tremendous variety of canned fruits, canned vegetables, canned baby foods, as well as the fresh supply of these commodities which originate throughout the West.

The Bureau's power program is developed to the point where the benefits of well over 3½ million kilowatts of electrical energy originating from over 30 plants built by the Bureau are available to most of the major western power markets. Water power was important during the war and such plants as Grand Coulee, Hoover, and Shasta made invaluable contributions to our war effort and are continuing to make substantial contributions in our defense and mobilization undertakings. The availability of this tremendous block of low-cost power has also made a basic contribution to the enjoyment of peacetime living.

Looking to the full development of western natural resources, Reclamation, in cooperation with the States, is conducting investigations on all major river basins of the West. These reports are being placed before the affected States for their comments prior to submitting to the President and to the Congress.

The recent signing, and approval by the Congress, of a compact between the affected States has now opened the way to proceed with further development of the water resources of the upper Colorado River Basin. River basin plans or inventories which have been transmitted to the President or to the Congress are: Columbia River Basin, Colorado River Basin, Central Valley of California, and the Middle Rio Grande Basin.

Reclamation's work, outside the 17 Western States, as specifically authorized by the Congress is evidenced in Alaskan investigations. The Eklutna project to further hydroelectric development in Alaska has been passed by Congress and approved by the President.

Reclamation's influence reaches further even than this northern outpost of America. For years, foreign nations have sought and received, in cooperation with the Department of State, technical advice and other assistance in planning and building water resources development projects. Many of these countries have benefited through the experience of this 48-year old Federal agency by sending their students and statesmen over here to study dams and power plants or by seeking the consultant services of Reclamation engineers.

Reclamation is world-famous for its unique engineering feats of having built the largest and highest dams of their kind, the longest irrigation tunnel, the largest hydroelectric power plant and the largest irrigation pumping plant. Data on these are as follows:

Largest concrete dam in the world (10,585,000 cubic yards)—Grand Coulee. Largest power plant in the world (1,974,000 kilowatts)—Grand Coulee (ultimate capacity). Largest pumping plant in the world (436,000,000 gallons per hour)—Grand Coulee. All of these to serve largest irrigation project—the million-acre Columbia Basin project, Washington.

Highest dam in the world, 726 feet high, Hoover Dam on the Colorado River, Ariz.-Nev.

Longest irrigation tunnel, the 13-mile Alva B. Adams tunnel on the Colorado-Big Thompson project, Colorado, designed to transport irrigation water to more than 600,000 acres of water-deficient lands in Colorado—this irrigation tunnel bores through the heart of the Rocky Mountains under the Continental Divide carrying Pacific Ocean water from the West to the eastern slope of the mountains where it eventually will flow to the Atlantic Ocean.

Chairman MURDOCK. I am sure this committee is interested in the multiple-purpose features of the program, including irrigation, power, and related phases. Will you bring us up to date on the irrigation phases from a physical standpoint?

Mr. LINEWEAVER. As I explained in the historical statement on reclamation, the Secretary of the Interior, by act of Congress on June 17, 1902, was authorized to construct through the Reclamation Service, now the Bureau of Reclamation, works needed to reclaim and develop the West. Since that time amendments to the basic Reclamation Act have expanded the scope and intent of the original legislation to include the multiple-purpose development of streams in the interest of irrigation, power, flood control, navigation, domestic and industrial water supply, and fish and wildlife preservation and propagation. Reclamation reservoirs also frequently serve other functions as well—for example, salinity control, sediment control, and recreation. Considering only the irrigation and multiple-purpose features and excluding all power developments and other works, the Bureau has built and now has in operation 110 storage dams, 65 diversion dams, over 16,000 miles of canals and main laterals, almost 4,600 miles of main drains and approximately 100 pumping plants. These features in 1950 provided water for 5,679,000 irrigable acres.

The water users who receive service through federally built project works are generally organized into districts and have executed approximately 300 voluntary repayment contracts through the operations of which $507,000,000 will be returned to the Government.

The basic policy of the Bureau of Reclamation is to encourage water users to take over the operation and maintenance of their irrigation distribution systems as soon as they are prepared to assume this responsibility. Pursuant to this policy many of the irrigation works enumerated above have been transferred to water users organizations for operation and maintenance. During fiscal year 1952, the operation of 57 storage dams, 31 diversion dams, 12,000 miles of canals and main laterals, 3,600 miles of drains and 95 pumping plants will be financed with the operation and maintenance funds appropriated to the Bureau. Negotiations are now progressing through which additional facilities will be transferred to water users organizations for operation and maintenance. Other features are still operated by the Bureau of Reclamation as a part of construction, pending completion of canal systems and other use facilities that enable project revenues accruing to finance annual costs.

Chairman MURDOCK. What are the crops produced on the land irrigated by reclamation works? In your opening statement, you mentioned the values. Will you insert in the record more details on this phase of your presentation?

Mr. LINEWEAVER. As I mentioned, Mr. Chairman, the value of the crops produced on land watered by reclamation works have exceeded half a billion dollars annually for the last 3 years. But, what is more important, it seems to us, is the character of the crops produced on reclamation lands. These crops generally are noncompetitive with what was formerly termed surplus crops, such as corn, wheat, and tobacco, produced on farm lands in humid areas in the South and East. Quite a heavy percentage of these crops, such as fruits and vegetables, contribute to the improved standards of living for the people of this country through meeting the requirements of better dietary practices.

As my statement will show, about two-thirds of the reclamation irrigated area is devoted to the production of feed, forage, and grains, which are used locally primarily for livestock production. I am submitting a general statement for the record accompanied by a tabulation of the acreage and crop values for each of the projects operated under the reclamation program.

(The statement is as follows:)

CROP RESULTS ON IRRIGATED LAND

Crops produced in 1950 on lands furnished a full or supplemental water supply from works constructed by the Bureau of Reclamation if loaded into freight cars would make a train extending from the Atlantic to the Pacific Ocean and back again. This indicates something of the volume of Reclamation production but not of value when measured as a part of our total productive effort. A high percentage of many of the Nation's highly prized protective foods are produced on Reclamation projects and find their way to all of the markets of the country and our neighbors and allies. The feed and forage crops are fed locally making a twofold contribution to our Nation's wealth and security; first they are used to balance and make conservative use of the vast Federal, State, and private range resource possible thus creating the second benefit of more and better meat, wool, and other livestock products which are now in critically short supply. Another major contribution to the Nation's security is through the production in the West of many of the commodities needed to support the growing population and defense establishments located there thus relieving pressures on transcontinental transportation facilities.

Preliminary estimates indicate that during 1950 almost 14 million tons of food, forage, and fiber crops having a farm value of about 543 million dollars were produced on 5,149,229 acres of land furnished either a full or supplemental irrigation water supply from works constructed by the Bureau of Reclamation. This was the second largest and most valuable crop produced. In 1946 a record of 14½ million tons and in 1947 a record of 555 million dollars of crops were grown. Tonnage records were initiated in 1943 and since that time production has exceeded 10 million tons annually with a total of about 102 million tons in this 8-year period. Estimates based on both crop tonnage and acreage irrigated indicate that from 250 to 300 million tons of fruits, vegetables, cotton, sugar beets, and feed and forage for livestock have been produced from Reclamation watered lands since construction of the first project.

The production in 1950 exceeded the half billion dollar mark for the fifth consecutive year, bringing the cumulative total to more than 7 billion dollars. This is about three and one-half times the Federal investment in all projects, including those presently under construction and the project costs serving flood control, power, recreation and other purposes.

The preliminary estimates indicate an average value per acre of $105.59, the sixth consecutive year in which production has exceeded $100 per acre. The 14-million-ton crop valued at 543 million dollars represents approximately 100,000 full and part-time farms on 61 projects. The estimates do not include production from projects under construction, the value of livestock produced on Reclamation farms nor the worth to range livestock production of having Reclamation produced feeds for supplementing grazing on nearby national forest and Federal range.

The crops produced by Reclamation projects do not compete generally with crops produced in other agricultural areas. Approximately two-thirds of the acreage irrigated produces feed, forage, and grains which are used locally. Around 15 percent of the area is used for the production of vegetable, truck, and fruit crops which supply some of the Nation's critical demands for protective foods. Sugar beets, seed crops, and miscellaneous plantings, including cotton in adapted areas, account for the remaining percentage.

The preliminary estimate of acreage and crop value, by projects follows:

Preliminary—comparative summary of acreages in cultivation and gross crop values, 1949 and 1950

Project	Net area in cultivation		Total gross crop values		Average value per acre	
	1949, actual	1950, indicated	1949, actual	1950, indicated	1949, actual	1950, indicated
All-American Canal, Calif.:	*Acres*	*Acres*				
Coachella division	24,483	31,000	$16,103,356	$13,216,700	$657.74	$426.35
Imperial irrigation district	440,000	440,000	72,638,099	64,386,000	165.09	146.33
W. C. Austin, Oklahoma	36,255	48,000	3,087,440	2,886,550	85.16	60.14
Baker, Oreg.	7,255	7,305	261,355	247,900	36.02	33.94
Balmorhea, Tex.	7,411	8,910	795,723	1,500,500	107.37	168.41
Belle Fourche, S. Dak.	52,409	52,767	2,095,481	1,505,327	39.98	28.53
Bitter Root, Mont.	16,482	16,445	510,878	582,720	31.00	35.43
Boise, Idaho-Oreg.	182,867	185,100	15,460,057	14,090,000	84.54	76.12
Buffalo Rapids, Mont.	20,900	22,139	931,113	744,831	44.55	33.64
Buford-Trenton, N. Dak.	7,670	7,767	321,093	288,875	41.86	37.19
Burnt River, Oreg.	15,260	15,260	446,340	442,000	29.25	28.96
Carlsbad, N. Mex.	20,988	20,500	3,039,814	2,848,700	144.84	138.96
Central Valley, Calif.	322,870	499,689	48,232,869	08,955,253	149.39	218.05
Columbia Basin, Wash.	2,411	4,125	244,437	512,300	101.38	124.19
Deschutes:						
North unit, Oregon	45,067	49,000	5,037,085	7,655,666	117.69	156.24
Central Oregon Irrigation District	42,531	42,020	5,355,880	4,126,500	125.93	98.20
Frenchtown, Mont.	2,949	2,965	134,512	177,863	45.61	59.99
Fruitgrowers Dam, Colo.	2,134	2,180	231,537	270,230	108.50	123.96
Gila, Ariz.	12,529	12,637	1,420,664	1,283,398	113.39	101.56
Grand Valley, Colo.	28,896	29,125	2,149,315	2,435,000	74.38	83.61
Humboldt, Nev.	25,028	[1] 25,028	1,520,841	[1] 1,520,841	60.77	[1] 60.77
Huntley, Mont.	24,717	25,370	1,495,443	1,385,100	60.50	54.60
Hyrum, Utah	5,603	5,602	319,526	305,170	57.03	54.48
Intake, Mont.	403	440	23,563	22,582	58.47	51.32
Kendrick, Wyo.	5,197	6,800	123,580	192,400	23.78	28.29
Klamath, Calif.-Oreg.	76,759	75,850	10,070,976	10,653,000	131.20	140.45
Lewiston Orchards, Idaho		2,700		628,500		232.78
Lower Yellowstone, Mont.-N. Dak.	49,070	49,150	2,859,166	2,813,145	58.27	57.24
Mancos, Colo.	6,457	6,400	208,248	229,000	32.25	35.78
Milk River, Mont.	79,121	80,535	3,616,005	3,456,250	45.70	42.92
Minidoka, Idaho-Wyo.	299,512	294,000	19,123,444	17,018,000	63.85	57.88
Mirage Flats, Nebr.	11,163	11,594	411,001	846,474	36.82	73.01
Missoula Valley, Mont.	414	538	9,340	16,106	22.56	29.94
Moon Lake, Utah	58,834	58,680	1,103,697	887,700	18.76	15.13
Newlands, Nev.	52,106	52,900	2,784,202	2,986,113	53.43	56.45
Newton, Utah	2,230	2,125	130,759	114,846	58.64	54.05
North Platte, Nebr.-Wyo.	197,463	194,346	10,882,754	8,867,298	55.11	45.63
Ogden River, Utah	15,864	16,095	1,335,462	1,235,050	84.18	76.74
Okanogan, Wash.	3,824	3,491	723,687	996,550	189.25	285.46
Orland, Calif.	16,706	16,750	1,504,794	1,392,233	90.08	83.12
Owyhee, Idaho-Oreg.	95,122	95,000	10,970,303	8,500,000	115.33	89.47
Pine River, Colo.	31,866	31,680	768,722	651,100	24.12	20.55
Preston Bench, Idaho	4,144	4,118	309,076	296,580	74.58	72.02
Provo River, Utah	39,120	38,987	3,447,329	2,880,823	88.12	73.89
Rapid Valley, S. Dak.	5,974	7,700	175,974	182,120	29.46	23.65
Rathdrum Prairie, Idaho:						
Post Falls unit	2,754	2,770	125,366	141,005	45.52	50.90
Hayden Lake unit	830	514	48,380	32,881	58.29	63.97
Rio Grande, N. Mex.-Tex.	159,598	160,341	40,109,580	40,239,059	251.32	250.96
Riverton, Wyo.	41,919	41,800	2,010,974	1,744,576	47.97	41.74
Salt River, Ariz.	225,621	225,152	30,807,031	35,731,376	136.54	158.70
Sanpete, Utah	11,651	11,120	360,409	310,102	30.93	27.89
Scofield, Utah	15,009	15,593	781,576	526,215	52.07	33.75
Shoshone, Mont.-Wyo.	64,357	70,840	2,950,546	2,833,804	45.85	40.00
Strawberry Valley, Utah	38,458	38,500	2,133,444	1,911,750	55.47	49.66
Sun River, Mont.	85,860	88,751	2,604,750	1,984,713	30.34	22.36
Truckee Storage, Calif.-Nev.	23,235	23,195	1,494,467	1,410,000	64.32	60.79
Tucumcari, N. Mex.	22,961	32,450	1,177,884	1,574,740	51.30	48.53
Umatilla: East and west divisions, Oregon	12,266	12,066	423,751	456,945	34.55	37.87
South division:						
Stanfield irrigation district	5,435	5,570	311,419	371,300	57.30	66.66
Westland irrigation district	4,716	4,830	218,120	249,580	46.25	51.67
Uncompahgre, Colo.	67,153	67,987	3,762,602	3,207,110	56.03	47.18
Vale, Oreg.	30,070	30,000	2,194,767	1,773,600	72.99	59.12
Weber River, Utah	90,801	90,350	9,394,389	6,978,525	103.46	77.24
Yakima, Wash.	201,461	210,710	26,634,646	31,114,750	132.21	147.67
Yuma, Ariz.-Calif.	58,738	58,600	15,251,108	10,273,775	259.65	175.32
Subtotal	3,560,957	3,793,952	395,210,149	439,099,100	110.98	115.74

[1] 1950 estimate.

Preliminary—comparative summary of acreages in cultivation and gross crop values, 1949 and 1950—Continued

Project	Net area in cultivation		Total gross crop values		Average value per acre	
	1949, actual	1950, indicated	1949, actual	1950, indicated	1949, actual	1950, indicated
Additional lands served through Government-constructed works [1]	*Acres* 1,355,277	*Acres* 1,355,2771	$21,118,859	$104,583,420	$89.37	$77.17
Grand total	4,916,234	5,149,229	516,329,008	543,682,520	105.03	105.59

NOTE.—Includes class 5 lands in production, temporarily suspended from paying construction charges.

Chairman MURDOCK. You mentioned the place of power operations in the reclamation program. Will you submit for the record more detailed information on this subject?

Mr. LINEWEAVER. As I mentioned, the total existing name-plate capacity of power installations on reclamation projects is 3,583,767 kilowatts. When all authorized plants are completed, the total installed capacity of plants on reclamation projects and of those from which the power will be transmitted and sold will total 7,543,957 kilowatts. This latter figure includes 1,470,000 kilowatts from six power plants under the Missouri River Basin project where the installations will be made by the Corps of Engineers of the Department of the Army. Under the Flood Control Act of 1944, the Bureau of Reclamation will transmit this power to market centers and will have jurisdiction over the sale of the output of the power at these plants. I am submitting this table for the record.

(The table is as follows:)

Hydroelectric plants on reclamation projects—operating, under construction, or authorized as of Dec. 31, 1950

A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Existing name-plate capacity (kilowatts)	Ultimate name-plate capacity (kilowatts)	Number of existing generators and capacities (kilowatts)	Ultimate number of generators and capacities (kilowatts)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Arizona-Nevada	Boulder Canyon	Hoover [1]	1936	1,034,800	1,332,300	12-82,500; 1-40,000; 2-2,400	15-82,500; 1-40,000; 1-50,000; 2-2,400.
2. Arizona-California	Parker	Parker	1942	120,000	120,000	4-30,000	4-30,000.
3. California	Central Valley	Keswick	1949	75,000	75,000	3-25,000	3-25,000.
4. California	Central Valley	Shasta	1944	379,000	379,000	5-75,000; 2-2,000	5-75,000; 2-2,000.
5. California	Yuma	Siphon Drop	1926	1,600	1,600	2-800	2-800.
6. Colorado	Colorado-Big Thompson	Estes	1950	30,000	45,000	2-15,000	3-15,000.
7. Colorado	Colorado-Big Thompson	Green Mountain	1943	21,600	21,600	2-10,800	2-10,800.
8. Idaho	Boise	Anderson Ranch	1950	13,500	[2] 40,500	1-13,500	3-13,500.
9. Idaho	Boise	Black Canyon	1925	8,000	8,000	2-4,000	2-4,000.
10. Idaho	Boise	Boise Diversion	1912	1,500	1,500	3-500	3-500.
11. Idaho	Minidoka	Minidoka	1909	13,400	13,400	1-5,000; 1-2,400; 5-1,200	1-5,000; 1-2,400; 5-1,200.
12. Wyoming	North Platte	Guernsey	1927	4,800	4,800	2-2,400	2-2,400.
13. Wyoming	North Platte	Lingle	1919	1,400	1,400	2-400; 2-300	2-400; 2-300.
14. New Mexico	Rio Grande	Elephant Butte	1940	24,300	24,300	3-8,100	3-8,100.
15. Washington	Columbia	Grand Coulee [3 4]	1941	1,040,000	1,974,000	15-108,000 (3); 2-10,000	18-108,000 (3); 3-10,000.
16. Washington	Yakima	Prosser [5]	1932	2,400	[6] 2,400	1-2,400	1-2,400.
17. Wyoming	Kendrick	Seminoe	1939	32,400	32,400	3-10,800	3-10,800.
18. Wyoming	Missouri River Basin	Kortes	1950	24,000	36,000	2-12,000	3-12,000.
19. Wyoming	Riverton	Pilot Butte	1925	1,600	1,600	2-800	2-800.
20. Wyoming	Shoshone	Heart Mountain	1948	5,000	5,000	1-5,000	1-5,000.
21. Wyoming	Shoshone	Shoshone	1922	5,600	5,600	1-4,000; 2-800	1-4,000; 2-800.
Subtotal A				3,439,900	4,123,000		

B. CONSTRUCTED BY BUREAU OF RECLAMATION: OPERATED BY OTHERS

1. Arizona	Salt River	Arizona Falls [7]	1913	850	850	2-425	2-425.
2. Arizona	Salt River	Cross Cut [7]	1914	5,100	5,100	1-3,000; 3-700	1-3,000; 3-700.
3. Arizona	Salt River	Roosevelt	1909	15,400	15,400	5-1,080; 1-4,000; 1-6,000	5-1,080; 1-4,000; 1-6,000.
4. Arizona	Salt River	S. Consolidated [7]	1912	1,600	1,600	2-800	2-800.
5. Colorado	Grand Valley	Grand Valley (Palisades)	1932	3,000	3,000	2-1,500	2-1,500.
6. Nevada	Newlands	Lahontan	1911	1,780	1,920	1-500; 2-640	3-640.
7. Oregon	Deschutes	Cove [8]	1946	1,500	1,500	1-1,500	1-1,500.
8. Utah	Strawberry Valley	Spanish Fork [9]	1908	1,550	1,550	2-450; 1-250; 1-400	2-450; 1-250; 1-400.
9. Washington	Yakima	Rocky Ford	1916	187	187	1-187	1-187.
Subtotal B				30,967	31,107		

See footnotes at end of table, p. 21.

Hydroelectric plants on reclamation projects—operating, under construction, or authorized as of Dec. 31, 1950—Continued

C. CONSTRUCTED AND OPERATED BY WATER USERS ORGANIZATIONS

State	Project	Name of plant	Calendar year of initial operation	Existing name-plate capacity (kilowatts)	Ultimate name-plate capacity (kilowatts)	Number of existing generators and capacities (kilowatts)	Ultimate number of generators and capacities (kilowatts)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Arizona	Salt River	Chandler [10]	1919	600	600	1-600	1-600.
2. Arizona	do	Horse Mesa [10]	1927	30,000	30,000	3-10,000	3-10,000.
3. Arizona	do	Mormon Flat [10]	1926	7,000	7,000	1-7,000	1-7,000.
4. Arizona	do	Stewart Mtn.[10]	1930	10,400	10,400	1-10,400	1-10,400.
5. California	All-American	Drop No. 3 [11]	1941	4,800	9,600	1-4,800	2-4,800.
6. California	do	Drop No. 4 [11]	1941	9,600	19,200	1-9,600	2-9,600.
7. Oregon	Klamath	"C" Canal Drop [12]	1938	500	500	1-500	1-500.
Subtotal C				62,900	77,300		

D. CONSTRUCTED AND OPERATED BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER MARKETED BY BUREAU OF RECLAMATION

1. Montana	Fort Peck	Fort Peck	1943	50,000	105,000	1-35,000; 1-15,000	3-35,000.

E. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

1. Alaska	Eklutna	Eklutna	1954	0	30,000	None	3-10,000.
2. Arizona-Nevada	Davis	Davis	1951	0	225,000	do	5-45,000.
3. California	Central Valley	Folsom	1954	0	162,000	do	3-54,000.
4. California	do	Nimbus	1953	0	5,000	do	1-5,000.
5. Colorado	Colo.-Big Thompson	Flatiron	1953	0	63,000	do	2-31,500.
6. Colorado	do	Marys Lake	1951	0	8,100	do	1-8,100.
7. Colorado	do	Polehill	1953	0	33,250	do	1-33,250.
8. Idaho	Palisades	Palisades	1956	0	112,500	do	5-22,500.
9. Montana	Missouri R. Basin	Angostura	1951	0	1,200	do	1-1,200.
10. Montana	do	Canyon Ferry	1953	0	50,000	do	3-16,666.
11. Montana	Hungry Horse	Hungry Horse	1952	0	285,000	do	4-71,250.
12. Wyoming	Missouri R. Basin	Boysen	1952	0	15,000	do	2-7,500.
Subtotal E				0	990,050		

F. UNDER CONSTRUCTION BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER TO BE MARKETED BY BUREAU OF RECLAMATION

1. North Dakota	Missouri R. Basin	Garrison	1955	0	400,000	None	5-80,000.
2. South Dakota	do	Ft. Randall	1954	0	320,000	do	8-40,000.
Subtotal F				0	720,000		

G. AUTHORIZED TO BE CONSTRUCTED BY BUREAU OF RECLAMATION

1. Colorado	Colo.-Big Thompson	Big Thompson		0	6,700	None	1-6,700.
2. Idaho	Minidoka	American Falls	1953	0	30,000	do	4-7,500.
3. Montana	Missouri R. Basin	Kenil	1955	0	1,600	do	2-800.
4. Montana	do	Little Porcupine	1954	0	[12] 24,000	do	4-6,000.
5. Montana	do	Lyon		0	24,000	do	3-8,000.
6. Montana	do	Mission		0	50,000	do	3-16,667.
7. Montana	do	Portage		0	20,000	do	2-10,000.
8. Montana	do	Tiber	1955	0	2,000	do	3-633.
9. Montana	do	Yellowtail	1957	0	200,000	do	4-50,000.
10. Nebraska	do	Harlan		0	1,200	do	1-1,200.
11. North Dakota	do	Crosby		0	48,000	do	6-8,000.
12. North Dakota	do	Des Lace		0	60,000	do	6-10,000.
13. South Dakota	do	Miller Drop		0	180,000	do	4-45,000.
14. Washington	Yakima-Kennewick Div.	Chandler	1953	0	12,000	do	2-6,000.
15. Washington	Yakima-Roza Div	Roza	1953	0	10,000	do	2-5,000.
16. Wyoming	Kendrick	Alcova	1954	0	36,000	do	2-18,000.
17. Wyoming	Missouri R. Basin	Bald Ridge	1959	0	30,000	do	3-10,000.
18. Wyoming	do	Hunter Mountain		0	12,000	do	2-6,000.
19. Wyoming	do	Sunlight		0	20,000	do	2-10,000.
20. Wyoming	do	Thief Creek		0	60,000	do	3-20,000.
21. Wyoming	do	Tongue River		0	25,000	do	2-12,500.
Subtotal G				0	852,500		

H. AUTHORIZED TO BE CONSTRUCTED BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER TO BE MARKETED BY BUREAU OF RECLAMATION

1. South Dakota	Missouri R. Basin	Big Bend	1960	0	120,000	None	6-20,000.
2. South Dakota	do	Gavins Point	1956	0	100,000	do	3-33,333.
3. South Dakota	do	Oahe	1960	0	425,000	do	5-85,000.
Subtotal H				0	645,000		
Total				3,583,767	7,543,957		

[1] Power plant units operated by power allottees under agency contract.
[2] 27,000 kilowatts authorized.
[3] Power marketed by Bonneville Power Administration.
[4] Main units with a name-plate rating at 108,000 kilowatts have continuous operating capacity of 120,000 kilowatts.
[5] Capacity is tentative and may be revised.
[6] Prosser will be removed when Chandler is built.
[7] Power plant constructed by Bureau of Reclamation with Salt River Valley Water Users' Association funds.
[8] Unit No. 3 installed in Pacific Power & Light Co.'s plant.
[9] Three plants: (*a*) Spanish Fork (upper); (*b*) Spanish Fork (lower): (*c*) Payson.
[10] Constructed and operated by Salt River Valley Water Users' Association.
[11] Constructed and operated by Imperial irrigation district.
[12] Constructed and operated by Enterprise irrigation district.

Chairman MURDOCK. You mentioned the power revenues from reclamation projects. Would you care to submit some more detailed information? Since the figure of 36 million dollars annually is a substantial amount, you might desire to show how this revenue has increased annually, especially in recent years.

Mr. LINEWEAVER. It is true that the power revenues have increased annually at a very substantial rate and the figures are especially significant in view of the fact that the greater part of these revenues are paid into the reclamation fund. I will submit a statement covering the power revenues.

(The statement is as follows:)

POWER REVENUES

Cumulative gross power revenues through June 30, 1950, totaled $237,955,177. The influence of several of the very large power installations which have been put on the line during recent years on this figure is evidenced by gross revenues for the last 5 years which accounts for nearly 60 percent of the total. Data on gross revenues for the past 5 years is given in the following tabulation:

Fiscal year:	
1946	$23, 035, 959
1947	23, 021, 391
1948	25, 786, 602
1949	33, 168, 169
1950	36, 361, 663
Total	141, 373, 784

Chairman MURDOCK. Give us some examples of the relationship between power and irrigation particularly with respect to the financial assistance that is given by power to irrigation developments.

Mr. LINEWEAVER. I will be glad to do that, Mr. Chairman, using several of the large projects as outstanding examples.

On the Columbia Basin project in Washington State, repayment by the irrigators according to current estimates will amount to 28 percent of the cost of the irrigation features, while the remainder of the irrigation costs will be repaid from power revenues arising from the ultimate installations of 1,974,000 kilowatts at Grand Coulee Dam. On the Central Valley project in California, House Document 146 of the Eightieth Congress, first session, shows that irrigation water users will repay $58,545,475 or 27 percent of the cost allocated to irrigation and that the remainder will be repaid from power revenues and by municipal and industrial water users. On the Colorado-Big Thompson project in Colorado, the repayment by the irrigation water users of the Northern Colorado Water Conservancy District, through their canal companies and other organizations, will be about one-third of the irrigation costs according to current estimates, with the balance to be repaid from power revenues. On the Missouri Basin project, with current costs and expected revenues, irrigators will probably repay under one-fourth of the costs allocated to irrigation.

Chairman MURDOCK. Will you insert for the record a brief statement on the Federal power policy as allied to Reclamation?

Mr. LINEWEAVER. I will be glad to do that, Mr. Chairman, and since it is reasonably brief, I will let the statement speak for itself.

(The statement is as follows:)

Power Policy

The general power policy of the Bureau of Reclamation is enumerated in many pieces of enacted legislation. In no uncertain terms these acts of Congress specify that Federal dams shall where feasible include facilities for generating electrical energy; preference in power sales shall be given to public agencies and cooperatives; power disposal shall be for the particular benefit of domestic and rural consumers; power shall be sold at the lowest possible rates consistent with sound business principles; and power disposal shall be such as to encourage widespread use and to prevent monopolization.

In marketing of power, transmission facilities to major load centers are constructed by the Bureau of Reclamation. However, beyond such load centers the Bureau, where possible, negotiates arrangements with private power companies to utilize existing excess transmission capacity when it is in the public interest to do so and to the extent that such arrangements are consistent with the principles laid down in the acts of the Congress governing the disposal of power from government projects. During the past year there have been a number of such negotiations successfully concluded. At this time last year, the Bureau was endeavoring to consummate wheeling arrangements with 5 major private utilities and can now report success in reaching agreements with 4 of those companies. Negotiations are continuing with the remaining utility but to date no agreement has been reached which will meet the requirements as laid down by Congress in enacted legislation.

The area served by the Bureau of Reclamation is rich in natural resources, many of which are required for national defense and essential civilian requirements. Most of this area is at present inadequately supplied with power and in some cases, notably the Missouri Basin and the Southwest, power supplies and transmission facilities are woefully inadequate. At the same time potential perpetual water-power resources are continuing to waste to the sea while accelerated construction of fuel electric plants in many areas goes on apace. Bureau power so far as it is available is being used to serve the defense and civilian needs; to serve Army, Air, and Navy installations, to supply power for fertile irrigation areas increasingly needed for our balanced food needs, and to supply the already important and fast increasing industrial needs of the West. As an example, the Bureau of Reclamation contributed to the Northwest power pool from one plant, Grand Coulee, on January 8, 1950, an instantaneous peak of 1,937,000 kilowatts. This represents the greatest generation of hydroelectric current from one place ever produced in the history of the world. The hourly output of power amounting to 1,905,000 kilowatt-hours also sets a world record. This quantity of energy would be sufficient to produce 190,500 pounds of aluminum. Power is a major source of revenue to the United States Treasury for use in repaying costs of Reclamation projects as is evidenced by the fact that the annual sale of electrical energy by the Bureau increased from 18,358 million kilowatt-hours in fiscal year 1949 to 20,088 million kilowatt-hours in fiscal year 1950, an increase of 9 percent, while revenue increased from $32,285,000 to $36,333,000 for the same period, an increase of 11 percent.

The present national emergency has greatly increased the urgent demand for power and the program presented herewith will in part help alleviate power shortages that now exist. However, even with this program, we cannot hope to meet the ever-increasing and urgently required needs for power. We must continue with our developments as rapidly as possible for these are the muscles of the Nation which must be made strong.

In fiscal year 1952 appropriations are sought to complete the installation of the final generators at Grand Coulee which will bring its capacity to 1,974,000 kilowatts; the installation of an additional 215,000 kilowatts of capacity in the Hoover power plant on the Boulder Canyon project; and the installation of 15,000 kilowatts of capacity at the Boysen power plant on the Missouri River Basin project. It is also proposed to continue work on the Hungry Horse project in Montana, on the Canyon Ferry project of the Missouri River Basin project, the Eastern Slope power plants on Colorado-Big Thompson project in Colorado, and the Folsom power plant on the Central Valley project in California. All of these projects will contribute substantially to the power supply needed for national defense. The first unit in Hungry Horse is scheduled for operation in October 1952, with the total capacity of the power plant of 285,000 kilowatts being on the line in November 1953. The Colorado-Big Thompson project will add 96,250 kilowatts of capacity to the Bureau system in fiscal year 1953, the first unit

at Folsom is scheduled for operation in July of 1954, with the second and third units to be completed by October of 1954, thus adding 160,000 kilowatts more capacity to the system. It is also proposed to start construction on the Alcova power plant of the Kendrick project in Wyoming, and the American Falls power plant of the Minidoka project in Idaho. Alcova will add 36,000 kilowatts of capacity by June 1954 and American Falls 30,000 kilowatts of capacity by March 1954. These are the major power plants on which it is planned to do work in fiscal year 1952. In addition, work will continue on backbone transmission lines that are required to market Bureau power, not only from its own power plants but also from plants being constructed by the Corps of Engineers in the Missouri Basin for which the Bureau has been designated the marketing agent.

The operation and maintenance budget presented herewith is a minimum budget that is required to keep all power facilities operating at full production during this national emergency. During the last war, due to lack of manpower and materials, and also the urgent demand for every kilowatt of power, maintenance work was largely restricted at most projects, and this substandard maintenance program resulted in allowing some projects to become run down to the point where it was questionable as to how much longer they would have continued to function without major rehabilitation work. With the end of this period a long and tedious maintenance process during the past 5 years was necessary to bring these facilities back into their normal operating condition. Every effort now should be made to see that inadequate maintenance does not duplicate the previous situation but instead we must keep our facilities in top condition if we expect to contribute to the utmost in these troublous times.

Chairman MURDOCK. In previous hearings, you have presented statistics on the market for nonwestern products which have been created by reclamation projects. You mentioned this interesting phase in your opening statement, and I will be glad if you will elaborate on that.

Mr. LINEWEAVER. The volume of goods purchased in the non-Western States of the Nation and shipped into western markets indicates the importance of western development to the Nation's economy. Similarly, the importance of reclamation developments to the west and to the Nation as a whole can be measured from carloadings destined to reclamation areas. The statement I am submitting will give a striking illustration of this situation.

(The statement is as follows:)

FREIGHT SHIPMENTS INTO AND OUT OF FEDERAL RECLAMATION AREAS

The benefits of reclamation go much beyond the farm. They are shared in one form or another by merchants, transportation systems, manufacturers, laborers, and practically all business people throughout the Nation. The extent of benefits flowing from reclamation developments to business concerns, however, is difficult to measure. One indication of such benefits is the expansion that occurs in freight movements to and from a project area. Volume of freight shipments shows directly the business created for transportation agencies, but also is indicative of the benefits accruing to merchandising houses, manufacturers, and consumers in distant markets.

Data for 1939, 1946, 1948, and 1949 have been made available by the Union Pacific Railroad of the number and value of carload shipments of freight into Ada and Canyon Counties, Idaho. In these counties the business activity and market furnished for eastern products is due, primarily, to the irrigation development of the Boise project of about 290,000 acres. The shipments received include such products as automobiles, tractors and other farm machinery, construction equipment, fencing, petroleum products, refrigerators, stoves, radios, washing machines and other household equipment, hardware, plumbing supplies, steel products, paper, and other miscellaneous products.

In 1949 approximately 40 percent of the volume and 72 percent of the value of all railroad shipments of freight into Ada and Canyon Counties were from the 37 States east of the Rocky Mountains. From 1939 to 1949 the volume increased from about 2,200 to more than 8,235 carloads and the value increased from $6.5 million to $92.2 million.

For every carload of freight shipped out of the area in 1949 one carload was shipped into the area. The in-shipments totaled 20,476 cars valued at $127.6 million and the out-shipments amounted to 21,403 cars valued at $50.7 million. Truck freight shipped in would increase these figures by about one-fourth. Thus the total in and out shipments in 1949 approximate an equivalent of about 52,000 cars valued at $223 million.

In 1910, approximately 5,000 carloads of freight were shipped out of the Salt River project area of Arizona. By 1947, with the development of modern irrigation in the area, these shipments had increased to almost 36,000 carloads. On the basis of the same relationship between in and out shipments in the Boise project area, this represents rail shipments into the Phoenix market area of about 54,000 carloads valued at $188 million.

The Scottsbluff area of the North Platte project in Nebraska received 283 carloads of freight in 1900. With the development of irrigation in the area these in-shipments increased to 1,447 carloads in 1910, 6,207 in 1940, and 7,144 in 1942. In this area the freight shipped in is more than twice the volume shipped out of the area. Further, the carloads of in-shipments from States east of the Rocky Mountains were more than two times the number received from the 11 Western States.

On the basis of the data obtained for Ada and Canyon Counties, Idaho, the total shipments from Eastern States to all Federal reclamation areas, in 1949, is estimated at about $2,100 million and from the 11 Western States at about $815 million. The combined value of out-bound and in-bound shipments which reflects total business activity thus totals $2,915 million.

Chairman MURDOCK. Aside from the direct employment resulting from reclamation construction throughout the Nation by those engaged in the manufacture of supplies and construction of equipment for projects, what about some of the contributions reclamation project developments make directly to the Federal Treasury.

Mr. LINEWEAVER. I mentioned in my opening statement, that the Federal income from corporation, excise, and other tax payments into the Federal Treasury from 1916, when the Federal income tax was first imposed, is estimated at $2.3 billion. It is interesting to note that this figure exceeds by several hundred million dollars, the total investment by the Federal Government in reclamation works up to July 1, 1950. That total approximates $2 billion. These totals that I have given you, which are dealt with more at length in the statement I am submitting, do not include the contributions made by reclamation areas in taxes to local, county, and State governments.

(The statement is as follows:)

FEDERAL INCOME TAXES FROM RECLAMATION AREAS

Federal income, corporation, excise, and other tax payments received directly or indirectly from reclamation project areas are estimated to aggregate about 2.3 billion dollars. This is based on a sample analysis of 15 Federal reclamation projects which are estimated to have produced over $68 million in individual income taxes alone during 1950 with the total of these payments since the building of these projects amounting to over one-half billion dollars. Other Federal tax payments in these areas is estimated at approximately a quarter of a billion dollars. Thus total Federal revenues in 15 project areas is estimated in excess of three-fourths billion. These revenues constitute a partial measure of the extent to which reclamation projects contribute to the stability, productive capacity, and defense of the Nation.

The Federal individual income taxes paid directly and indirectly from 15 typical Federal reclamation project areas, include taxes paid by irrigation farmers, townspeople and business in the general project area. For these 15 selected areas, approximately $68,000,000 of Federal individual income taxes were paid in 1950 and about $525,000,000 since development of the areas.

Estimated individual income taxes

Project	1950	Total	Project	1950	Total
Belle Fourche	$260,000	$2,532,000	Salt River	$23,495,000	$187,675,000
Bitterroot	224,000	2,060,000	Shoshone	245,000	2,870,000
Boise	10,082,000	66,405,000	Sun River	312,000	3,270,000
Carlsbad	836,000	4,744,000	Vale and Owyhee	1,730,000	14,878,000
Huntley	217,000	1,881,000	Yakima	18,707,000	157,683,000
Lower Yellowstone	441,000	4,343,000	Yuma	2,452,000	19,853,000
Milk River	558,000	4,276,000			
Rio Grande	8,468,000	51,215,000	Total	68,206,000	525,435,000
Riverton	179,000	1,750,000			

In addition to the above-estimated tax revenue a share of corporation income taxes, excise and other Federal taxes are directly and indirectly related to the business and industrial activity in these areas. As an example the estimates for Maricopa County, Ariz., representing the Salt River project area include $23,552,000 of corporation taxes and $18,315,000 of other miscellaneous tax revenues, bringing the total Federal tax revenue from the area to about $65,000,000.

For the 15 projects for which estimates were made, the individual income taxes of $525 million plus about $250 million of corporation tax revenues bring the total to approximately $750,000,000 since development of the areas. The Federal project-development cost in these 15 areas is about $285,000,000; thus the total Federal tax revenue accruing from the over-all activities of the areas is about 2½ times the Federal project cost. This cost includes expenditures for project extensions in some areas such as the Roza division of the Yakima project, the Payette division of the Boise project, and the Heart Mountain division of the Shoshone project which do not add to the historical base.

These data indicate that, since Federal income taxes were initiated, approximately 1.55 billion of individual income taxes and about 2.3 billion dollars of all Federal taxes have been paid from all reclamation project areas receiving either a full or supplemental water supply from federally constructed works.

Chairman MURDOCK. Will you insert for the record a few figures on the population expansion in the West as compared with the remainder of the country?

Mr. LINEWEAVER. I will be glad to do that Mr. Chairman. It should be explained that the heavy increases in population on the Pacific coast, principally, has increased the burden on agricultural production in the entire West and, therefore, increases the demand for irrigated land. I am submitting details for the record.

(The statement is as follows:)

POPULATION

The rate of population increase for the 11 Western States since 1900 has been over five times as great as the rate of increase for the rest of the country. Western development is brought into sharp focus when analyzed in terms of population trends as revealed by official census count. In 1900 the combined population of the United States was slightly under 76 million and the population of the 11 Western States was a little over 4 million. Thus, not quite 5.5 percent of the United States population was located in the 11 Western States. By 1910, 7.4 percent of the people of the United States lived in the 11 Western States, by 1920, 8.5, by 1930 the percentage was 9.3, and by 1940, 10.5. In 1950 the United States population had risen to 150,520,198 and the count of the 11 Western States to 19,385,586. The percentage of all of the people of the Nation living in the 11 Western States had thus increased from slightly under 5.5 percent in 1900 to nearly 12.9 percent in 1950. Over the same 50-year period, the 17 Western States had increased from 11,187,961 in 1910 to 33,766,022. Expressed in terms of percentages, in 1900 14.7 percent of all of the Nation's people lived in the 17 Western States and by 1950, 21.7 percent.

The attached table presents data taken from 1950 census summaries which compares rates of growth for the selected States and State groups during the past decade.

United States population, 1950 census

	1950	1940	10-year net increase
			Percent
48 United States	[1] 150,520,198	131,669,275	14.3
31 Eastern States	115,261,942	103,969,303	10.8
17 Western States	33,766,022	27,036,281	24.9
11 Western States	19,385,586	13,883,265	39.6
3 Pacific States	14,343,757	9,733,262	47.3
17 Western States:			
Arizona	742,364	499,261	48.7
California	10,472,348	6,907,387	51.6
Colorado	1,315,206	1,123,296	17.1
Idaho	586,037	524,873	11.7
Kansas	1,898,519	1,801,028	5.4
Montana	587,196	559,456	5.0
Nebraska	1,308,394	1,315,834	−.5
Nevada	158,378	110,247	43.7
New Mexico	677,099	531,818	27.3
North Dakota	616,185	641,935	−4.0
Oklahoma	2,230,253	2,336,434	−.3
Oregon	1,510,148	1,089,684	38.6
South Dakota	650,025	642,961	1.1
Texas	7,677,060	6,414,824	19.7
Utah	686,842	550,310	24.8
Washington	2,361,261	1,736,191	36.0
Wyoming	288,707	250,742	15.1
Subtotal 17 Western States	33,766,022	27,036,281	24.9

[1] Includes 792,234 for the District of Columbia and 700,000 persons not yet allocated by States. These persons are seamen and transients whose home States are not definitely known.

NOTE.—The percentage of decrease shown in the above table for the States of Nebraska, North Dakota and Oklahoma is approximate.

Chairman MURDOCK. I feel that the record will not be complete unless we have some information on the human phases of the reclamation program. In other words, I would like to know something about the number of farm homes, the population on reclamation farms, the reclamation irrigated farms, the population of villages, cities, and towns that have been developed by or sustained by reclamation developments, as well as schools and other factors connected with the community life of reclamation areas.

Mr. LINEWEAVER. We have some very interesting facts on that subject. I will be glad to submit summaries for the record and to provide any other additional information.

(The statement is as follows:)

WEALTH CREATED BY RECLAMATION

By the end of 1950 nearly 100,000 farm families owned or were acquiring family-size farms on Federal reclamation projects located in the 17 Western States. These families included over a third of a million persons. In addition to these people who actually lived on farms and who constituted the "directorate" of reclamation, an additional 1½ million "stockholders" lived in towns and cities located on or tributary to reclamation projects.

The "directorate" and "stockholders" of Federal reclamation preside over a portion of the wealth created through irrigation development. Their bank deposits in 1949 aggregated nearly 1¼ billion dollars. The crops they sold during 1950 had an estimated market value of $543 million. They made sizable contributions to the operating revenue of the counties and States in which the projects were located and to the Federal Government as well. They helped finance the Federal Government also by the purchase of many millions of dollars in United States bonds.

The deposits in banks which directly service reclamation areas have been constantly increasing and for the last 4 years have averaged more than a billion

dollars a year. In 1949 deposits were up to approximately 1.2 billion and are expected to be greater for 1950 when the final canvass is tabulated.

Through the years, the importance of reclamation has been growing. In 1906 when the first crops grown on a federally-built irrigation project were marketed, the farm value of the crops produced on a little over 20,000 acres was about $245,000. Ten years later in 1916 crops grown on 858,000 acres had a value of nearly $33 million. In 1926, 2,278,000 acres produced crops worth over 110 million. By 1946, 4,397,000 acres were irrigated by federally built works and the value of the crops had increased to 531 million. In 1950 the crops produced on 5,149,000 acres were valued at $543 million bringing the cumulative value of crops produced on reclamation projects to well over $7 billion.

Tax payments which is another measure of the economic worth of resource development have never been tabulated for school districts, counties, and States. If such a tabulation were made, however, it would no doubt show that reclamation much more than pays its share. In the payment of Federal taxes, reclamation's contribution is significant. Tax payments have not been segregated by source of income; however, estimates based on a sample analysis of 15 project areas indicate that the total contribution of all reclamation project areas to Federal finance is $2.3 billion.

All of reclamation's contribution to the Federal Government is not restricted to tax payments. Under the basic principle of reimbursability of Federal reclamation projects, nearly $90 million of the $507 million in repayment contracts now in force have been liquidated by direct repayment from water users and through adjustments voted by Congress.

The volume of goods purchased in other States of the Nation and shipped into western markets serve to indicate the importance of western development to the Nation's economy. Similarly, the importance of reclamation development to the West and to the Nation as a whole can be measured in part by carloadings destined for reclamation areas. Two examples may serve to demonstrate this point. In 1900 only 283 carloads of goods from six States were shipped into the North Platte Valley of Nebraska. As irrigation got under way in 1910, 1,448 cars from 14 States were received and by 1940 the total had risen to 6,207 cars from 37 States. Rail shipments into Ada and Canyon Counties, Idaho, show a similar market growth. In 1939, in-bound shipments totaled 9,160 cars, 2,235 of which originated in the 37 States located east of the Rocky Mountains. Ten years later in 1949 in-bound shipments totaled 20,476 cars, of which 8,235 originated in the same eastern group. This by no means reflects the full growth in business activity as truck shipments which are known to be significant have not been sampled.

The greatest benefit of reclamation development to the American way of life, however, is not to be measured by the size of bank deposits or the number of bonds held or the value of crops and livestock produced or the carloads of supplies and equipment bought or of taxes paid, but rather in the number of family-size farms this program has created. The stability of the Nation and the wealth of any society in the final analysis must be measured in the health and security of the people themselves. All of the monetary tools used are simply devices for appraising the health, wealth, and security of the homes.

Mr. LINEWEAVER. Now, Mr. Chairman, with this preliminary information in response to your questions, I will turn the presentation of the program over to Assistant Commissioner Nelson, who will be at your service. I will not be able to be present Wednesday. He will represent the Bureau in the remainder of the hearings.

The CHAIRMAN. Well, we thank you, Mr. Commissioner, for your brief statement and we hope it will be elaborated on either in your prepared statement or by Mr. Nelson or others.

Mr. LINEWEAVER. I may say for the information of the committee, and this may go on the record as the data which will give the committee some idea as to how the budget estimate for 1952 is divided as between joint facilities, power, and irrigation: The total construction program for the Bureau included in the reclamation section of the budget was $222,108,150. This was apportioned as follows: Joint facilities, that is large dams like Grand Coulee, Shasta, and others, which have partly power and partly irrigation facilities, $29,226,832. The power allocation or power construction allocation

in the budget totaled about $99,383,693. And the irrigation construction allocation was approximately the same amount.

For this year, the allocation between power and irrigation is fairly evenly distributed.

(Statement off the record.)

Mr. ENGLE. The budget did recommend some power projects on the Columbia, didn't it?

Mr. LINEWEAVER. When authorized. They recommended eight million dollars for the Hells Canyon Project for construction by the Bureau of Reclamation when authorized and two by the Corps of Engineers when authorized.

Mr. ENGLE. There were two others on the Columbia that are already authorized by the Army engineers; isn't that right?

Mr. LINEWEAVER. Yes, sir; the Ice Harbor and The Dalles.

Mr. ENGLE. That is three power projects, two of which are authorized and one of which remains to be authorized; is that correct?

Mr. LINEWEAVER. That is right.

Mr. ENGLE. Two of them are not in reclamation, though?

Mr. LINEWEAVER. That is right.

Mr. ENGLE. Is that all that was recommended in the budget with reference to power?

Mr. LINEWEAVER. It seems to me that there were some in Tennessee Valley. I am not familiar with that.

Mr. ENGLE. What is the western situation on power, with reference to defense requirements? Do you know?

Mr. LINEWEAVER. I am not qualified to speak on that subject, but my understanding is that there are grave shortages especially in the Pacific Northwest.

Mr. ENGLE. We hear a lot of talk about shortages. I would like to know what it is.

Thank you very much, Mr. Chairman.

The CHAIRMAN. Mr. Budge.

Mr. BUDGE. The question was answered, Mr. Chairman. Thank you.

The CHAIRMAN. Mr. Saylor.

Mr. SAYLOR. Mr. Chairman, I would like to ask Mr. Lineweaver: According to your figures there is a little better than $94 million in this as a budget item allocated to power. Can you tell us how much of that is for the construction of power plants and how much for distribution systems?

Mr. LINEWEAVER. Not distribution systems; transmission.

Mr. SAYLOR. Transmission?

Mr. LINEWEAVER. We have transmission. I will submit those figures corrected, Mr. Saylor, and be glad to insert them in the record.

(The information is as follows:)

Estimates for these power amounts are as revised:

Power plants	[1] $65, 000, 000
Transmission lines and substations	33, 000, 000

[1] Includes approximately $24,000,000 cost of dams and appurtenant facilities to multipurpose projects.

Mr. SAYLOR. Now, one other thing: You say that the Bureau of the Budget said that their policy would be that there would be no new starts. Does that go so far as to cover a basin, the various basin projects? If you start some part of that and put up another unit

in that, is that considered by your department a new start, or is that just another part of an old start?

Mr. LINEWEAVER. Let me get that down to a single illustration. For instance, in the Missouri Basin project, which covered some hundred units——

Mr. SAYLOR. That is right.

Mr. LINEWEAVER. That rule applied to units as well as the whole basin. No new units, except one small unit which was necessary by reason of the flooding out of certain land by Canyon Ferry Reservoir. The Crow's Creek unit in Montana was included to be started this year. On the rest of them, funds had been provided previously. But no new units in the Missouri River Basin were started or authorized to start, except for the one that I mentioned.

Mr. SAYLOR. In central California, have you started or considered starting any new units there?

Mr. LINEWEAVER. No, sir.

Mr. SAYLOR. How about the Columbia, with the exception of the three that were mentioned by Mr. Engle?

Mr. LINEWEAVER. No new units in that; no, sir.

Off the record.

(Statement off the record.)

Mr. ENGLE. I was going to ask you about this business of new starts. I want to argue that with the budget a little bit.

Mr. LINEWEAVER. Argue with me?

Mr. ENGEL. No, the budget.

Mr. LINEWEAVER. Oh, that is all right.

Mr. ENGLE. I would like to know how they define a new start. If they define a new start as a new project altogether, they would have to make some exceptions on the American River. Now, the American River was reauthorized as a million acre-feet project with a powerhouse on it, and in the same bill Sly Park was included, which is an irrigation development. If they are going to say that they can proceed with the powerhouse, they will have to apply the same principles to Sly Park, won't they, because they were both authorized in the same bill and they are integral parts of the same projects?

Mr. LINEWEAVER. I would prefer that you answer your same question, with all due respect to——

Mr. ENGLE. I will have to go down and see Mr. Lawton. I recognize, of course, in this emergency the emphasis is going to be on putting those projects ahead which develop power because they need power.

The CHAIRMAN. We thank you, Mr. Lineweaver. I want to say to you that I am glad to have you go back to the Eightieth Congress to begin this review, but I might remind you that you could go back a little further, I mean the Bureau of Reclamation summarized the progress up to the beginning of the Seventy-ninth Congress, I recall, and you gave us a good backward look and also a forward look at the beginning of the Seventy-ninth Congress. We hope that further elaboration on this will give us more in detail.

Mr. LINEWEAVER. All right.

The CHAIRMAN. I will now insert in the record a copy of my letter of January 26, 1951, addressed to the Acting Commissioner of the Bureau of Reclamation, and his reply of February 9, 1951, together with the data accompanying same.

JANUARY 26, 1951.

Mr. GOODRICH LINEWEAVER,
Acting Commissioner, Bureau of Reclamation,
Department of the Interior, Washington, D. C.

DEAR MR. COMMISSIONER: After considering the President's message to the Eighty-second Congress and the recommendations in the President's budget for appropriations for the fiscal year 1952, I feel I need additional information.

We are all in accord with the views of the President that the needs of the defense program should be given first priority. The Congress and the people, generally, must give 100 percent cooperation in expediting needed legislation for conserving manpower, materials, and money that could well be used under normal conditions for other needed and useful purposes.

The production of food to sustain our Armed Forces and civilian population is an essential part of our defense program. Also, as men from the farming areas are released, after serving the required period as members of our Armed Forces, they will desire to establish homes on farms that do not now exist. We cannot, therefore, put aside entirely our program for providing irrigation to the arid lands of the West.

In order that my committee, and others interested, may have accurate information on which to appraise the adequacy of the Federal reclamation program and the recommendations that have been submitted to the Congress, I ask for the following:

1. A detailed statement of your program for general investigations for the fiscal year 1952. I note that a statement covering your general investigations program for the fiscal year 1951, showing the balance of funds needed to complete, was inserted at pages 514 to 534 of the hearings before a subcommittee of the Committee on Appropriations, United States Senate, on April 12, 1950.

It may be that you can furnish the needed information in shorter form; however, I would like to have the specific amounts required for each project under investigation. I would, also, like to have you indicate the projects for which investigations have reached the status where substantial sums are required for the purpose of drillings, in order to secure the engineering information needed in preparation of construction plans and specifications.

2. I desire full information in regard to reclamation projects that have been authorized, but for which adequate construction funds are not now available or recommended for appropriation for use during the fiscal year 1952. I am attaching hereto a list of projects that have been brought to my attention, for which I would like information, as follows: (*a*) A brief description of each of the projects listed, showing location, amount of land to be irrigated; (*b*) features, other than irrigation; and (*c*) approximate cost of project under prevailing conditions.

I particularly request that you advise me the amount of money that would be required to permit award of a contract for a major feature of the project and to carry a reasonable construction program through one fiscal year.

I am sure my list is not complete; therefore, I ask that you add other reclamation projects on which construction could be started promptly, if funds were available.

3. Inquiries are also being made regarding the status of legislation and reports on other needed but unauthorized reclamation projects. I am, therefore, submitting a list of projects on which I would like to have you furnish me brief descriptive statements, showing: (*a*) Location of project, (*b*) acreage to be irrigated and other multiple-purpose features, (*c*) approximate cost of project, (*d*) other details which you think will be of value to my committee.

Please advise me, in each instance, whether the reports have been submitted to Congress, are now in the Department here in Washington, before the Bureau of the Budget or when field reports may be completed.

I should like to have the information requested as early as convenient. I particularly desire the information regarding appropriations, requested as item 2, as it is entirely possible that it may be found desirable to bring some items to the attention of the Appropriations Committee, which, of course, will require time for study. I, therefore, suggest that you forward information requested, from time to time, as same is prepared.

Thanking you, I am

Very truly yours,

JOHN R. MURDOCK,
Chairman, Interior and Insular Affairs Committee.

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D. C., February 9, 1951.

Hon. JOHN R. MURDOCK,
Chairman, Interior and Insular Affairs Committee,
House of Representatives, Washington, D. C.

MY DEAR MR. MURDOCK: I am pleased to present the enclosed material which provides the detail data requested in your letter of January 26, 1951.

There are a series of descriptive statements arranged by States which include descriptions and locations of each investigation in the 1951 program and 1952 estimate. These descriptions are each marked "basin surveys," "project investigations," "general engineering and research," "advance planning," and "investigations of existing projects," as appropriate. There is also a one-page tabulation for each State summarizing the investigation program in that State. It should be explained that no statement is provided for the State of Nebraska inasmuch as all of the reclamation investigations there, other than those of a general nature extending over several States, are financed from Missouri River Basin project funds.

Under the heading "Potential projects for which funds are needed for drilling and detailed surveys," are listed those unauthorized projects, the investigations of which have progressed to the stage where additional funds could be profitably used for drilling and detailed surveys.

Under the heading "Proposed projects," there are listed a number of investigations which have progressed to the stage where they either have already been recommended for authorization or will soon be submitted to the Secretary of the Interior for his approval, prior to being recommended to the Congress.

The set of mimeographed sheets list the data you requested on certain authorized projects, or units of authorized projects, listing the total estimated cost, the estimated cost to June 30, 1951, the planning funds programed, the estimate of the minimum amount of money required to initiate construction and carry through one fiscal year, the balance to complete, and a general description of the project and the work involved. In accordance with your request, the projects covered in this group are limited to projects already authorized and for which no construction funds are included in the fiscal year 1952 budget estimate.

We are pleased to provide you with this information. If we can be of any further assistance, please do not hesitate to call on us.

Sincerely yours,

G. W. LINEWEAVER,
Acting Commissioner.

Program of general investigation by States[1] *(includes reclamation fund, Colorado River development fund and general fund), fiscal years 1951 and 1952*

State	Programed expenditures, fiscal year 1951			Estimated expenditures, fiscal year 1952		
	Wholly within the State	Partly within the State[2]	Total	Wholly within the State	Partly within the State[2]	Total
Arizona	$200,000	$596,000	$796,000	$191,000	$636,000	$827,000
California	1,035,000	310,000	1,345,000	919,000	391,000	1,310,000
Colorado	522,000	925,000	1,447,000	339,000	923,000	1,262,000
Idaho	334,000	569,000	903,000	180,000	514,000	694,000
Kansas	0	344,000	344,000	0	255,000	255,000
Montana	134,000	255,000	389,000	76,000	208,000	284,000
Nebraska	0	0	0	0	0	0
Nevada	85,000	253,000	338,000	48,000	209,000	257,000
New Mexico	391,000	1,145,000	1,536,000	318,000	1,118,000	1,436,000
North Dakota	3,000	5,000	8,000	3,000	4,000	7,000
Oklahoma	14,000	344,000	358,000	0	255,000	255,000
Oregon	351,000	479,000	830,000	311,000	562,000	873,000
South Dakota	6,000	0	6,000	6,000	0	6,000
Texas	244,000	393,000	637,000	250,000	257,000	507,000
Utah	629,000	551,000	1,180,000	474,000	557,000	1,031,000
Washington	243,000	378,000	621,000	129,000	352,000	481,000
Wyoming	196,000	523,000	719,000	125,000	523,000	648,000
Subtotal	4,387,000	7,070,000	11,457,000	3,369,000	6,764,000	10,133,000
Plus research, miscellaneous services, Alaskan investigations, etc.			426,000			485,000
Less unliquidated obligations, etc., included above			−527,000			−26,000
Less adjustment for duplications[2]			5,268,000			4,965,000
Grand total, general investigations			[3] 6,088,000			5,627,000

[1] Investigations in connection with the development of the Missouri River Basin project are not included in this tabulation.

[2] In each case the estimated expenditures shown for multi-State investigations, "partly within the State," are the total accounts to be spent on these investigations in all of the States involved which necessitates an adjustment as shown to correct for the duplications.

[3] Includes $48,500 contributed by State or local interests.

Program of general investigations in Arizona, fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Project investigations:		
Lower Colorado River Basin:		
Hassayampa project	$1,000	$1,000
Snowflake project	2,000	2,000
Holbrook project	5,000	5,000
Winslow project	2,000	2,000
Marble Canyon project	181,000	165,000
Investigations of existing projects:		
Gila project	3,000	11,000
Yuma auxiliary project	3,000	3,000
Salt River project	3,000	2,000
Total wholly within the State	200,000	191,000
Multi-State investigations partly within the State: [1]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys: Lower Colorado River Basin, Ariz., Calif., N. Mex., Nev., Utah	30,000	20,000
Project investigations:		
Colorado River storage project, Colorado, New Mexico, Utah, Wyoming, Arizona	228,000	334,000
Central Arizona project, Arizona, New Mexico	176,000	159,000
Investigations of existing projects: Yuma project, Arizona, California	3,000	----------
General engineering and research: Region 3, Arizona, California, Nevada, New Mexico, Utah	24,000	21,000
Total partly within the State	596,000	636,000
Grand total	796,000	827,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in California, fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Basin surveys:		
Central Pacific Basin: Russian River Basin	$1,000	$5,000
Southern Pacific Basin:		
Pajaro River Basin	49,000	36,000
San Luis Obispo County Basin	5,000	
Central Valley Basin:		
Central Valley Basin	70,000	80,000
Feather River Basin	48,000	95,000
Cache Creek Basin	1,000	
Project investigations:		
Southern Pacific Basin: Santa Maria project	17,000	13,000
Central Valley Basin:		
Central Valley project—ultimate plan:		
Sacramento River division	14,000	
Clikapudi unit	5,000	
Stony Creek division: Black Butte unit	24,000	32,000
Trinity River division	60,000	21,000
American River division:		
Folsom Canals unit	59,000	41,000
Union Valley unit	40,000	41,000
Georgetown Divide unit	15,000	45,000
Kings River division: North Fork Kings unit	37,000	
San Luis division	71,000	89,000
San Francisco Bay division	42,000	51,000
Upper San Joaquin River division	25,000	80,000
Lower Colorado River Basin: Palo Verde Mesa coordinating investigations	24,000	10,000
Lahontan Basin: Victor project	33,000	30,000
Southern Pacific Basin:		
San Diego project	[1] 35,000	41,000
Santa Margarita project	22,000	
Advance planning: Solano project	321,000	204,000
Investigations of existing projects: Yuma project, reservation division	8,000	5,000
Total wholly within the State	1,035,000	919,000
Multi-State investigations partly within the State: [2]		
Reconnaissance:		
Carson River project, California, Nevada	23,000	6,000
Washoe project, California, Nevada (formerly called Truckee River storage project extension)	15,000	70,000
United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys:		
Central Pacific Basin: Klamath River Basin, Calif., Oreg.	54,000	100,000
Lower Colorado River Basin, Ariz., Calif., Nev., N. Mex., Utah	30,000	20,000
Project investigations: Lahontan Basin, Washoe project	7,000	60,000
Investigations of existing projects:		
Klamath project, California, Oregon	19,000	12,000
Yuma project, Arizona, California	3,000	
General engineering and research: Region 3, Arizona, California, New Mexico, Nevada, Utah	24,000	21,000
Total partly within the State	310,000	391,000
Grand total	1,345,000	1,310,000

[1] Includes $20,000 contributed by local interests.
[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Colorado,[1] fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Reconnaissance:		
Cliffs-Divide project	$45,000	
Gunnison River project	3,000	
Project investigations:		
Upper Colorado River Basin:		
Fruitgrowers Dam project extension (formerly called Cedaredge unit, Grand Mesa division, Gunnison River project)	17,000	$11,000
Smith Fork project (formerly called Smith Fork unit, Crawford division, Gunnison project)	9,000	
Collbran project	14,000	40,000
Silt project	9,000	
Gunnison River project	8,000	6,000
Florida project	4,000	
San Miguel project	10,000	13,000
Saucer Valley project	11,000	
Nucla project	4,000	
Paradox project (formerly called West Paradox project)	10,000	5,000
Blue-South Platte project	64,000	18,000
Gunnison-Arkansas project	175,000	72,000
Cliffs-Divide project	127,000	155,000
Investigations of existing projects:		
Grand Valley project, Orchard Mesa division	8,000	17,000
Uncompahgre project	4,000	2,000
Total wholly within the State	522,000	339,000
Multi-State investigations party within the State:[2]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys:		
Upper Colorado River Basin, Arizona, Colorado, New Mexico, Utah, Wyoming	9,000	
Arkansas-White, Red River Basin, Colorado, Kansas, New Mexico, Oklahoma, Texas	338,000	250,000
Project investigations:		
Colorado River storage project, Colorado, New Mexico, Utah, Wyoming, Arizona	228,000	334,000
Yampa River project, Colorado, Wyoming, Savery-Pot Hook unit	46,000	7,000
Pine River project extension, Colorado, New Mexico	7,000	
Dolores project, Colorado, Utah	4,000	
Animas-La Plata project, Colorado, New Mexico	51,000	50,000
San Juan-Chama project, New Mexico, Colorado	101,000	175,000
General engineering and research: Region 5, Colorado, Kansas, New Mexico, Oklahoma, Texas	6,000	5,000
Total multi-State partly within the State	925,000	923,000
Grand total	1,447,000	1,262,000

[1] Does not include investigations of developments in connection with the Missouri River Basin project.
[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Idaho, fiscal years 1951 and 1952

Investigations	Estimated expenditures— Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Project investigations:		
Mountain Home project, Payette division	$5,000	$1,000
Michaud Flats project	6,000	22,000
Boise project-Payette division-Payette Heights unit	9,000	----------
Bruneau project	1,000	1,000
Bruneau River project	1,000	1,000
Birch Creek project	1,000	1,000
Camas Creek project	1,000	1,000
Big Wood River project	2,000	1,000
Big Lost River project, Mackay division	2,000	17,000
Advance planning: Minidoka project, north side pumping division	284,000	127,000
Investigations of existing projects:		
Boise project	20,000	8,000
Minidoka project	2,000	----------
Total wholly within the State	334,000	180,000
Multi-State investigations partly within the State: [1]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys:		
Columbia River Basin, Idaho, Mont, Oreg., Wash., Wyo	76,000	52,000
Clark Fork Basin, Idaho, Mont	10,000	24,000
Snake River Basin, Idaho, Oreg	68,000	98,000
Project investigations:		
Columbia River Basin:		
Rathdrum Prairie project, Idaho, Washington	42,000	16,000
Teton Basin project, Idaho, Wyoming	9,000	2,000
Hells Canyon project, Idaho, Oregon	70,000	114,000
Bonneville Basin: Bear River project	130,000	80,000
General engineering and research: Region 1, Idaho, Montana, Oregon, Washington, Wyoming	29,000	26,000
Total partly within the State	569,000	514,000
Grand total	903,000	694,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Kansas,[1] fiscal years 1951–52

Investigations	Estimated expenditures Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State	None	None
Multi-State investigations partly within the State: [2]		
Basin surveys: Arkansas-White, Red River Basin, Colo., Kans., N. Mex., Okla., Tex	$338,000	$250,000
General engineering and research: Region 5, Colorado, New Mexico, Kansas, Oklahoma, Texas	6,000	5,000
Total multi-State investigations partly within the State	344,000	255,000
Grand total	344,000	255,000

[1] Does not include investigations of developments in connection with the Missouri River Basin project.
[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Montana,[1] fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Project investigations:		
Columbia River Basin:		
Kalispell project	$44,000	$1,000
Bitterroot Valley project	8,000	7,000
Blackfoot River project	1,000	1,000
Lolo Creek project	2,000	1,000
Middle Clark Fork project	52,000	52,000
Investigations of existing projects:		
Frenchtown project	1,000	
Milk River project	11,000	4,000
Sun River project	4,000	1,000
Buffalo Rapids project	6,000	5,000
Huntley project	5,000	4,000
Total wholly within the State	134,000	76,000
Multi-State investigations partly within the State:[2]		
Reconnaissance:		
United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys:		
Columbia River Basin, Idaho, Montana, Oregon, Washington, Wyoming	76,000	52,000
Clark Fork Basin, Montana, Idaho	10,000	24,000
General engineering and research: Region 1, Idaho, Montana, Oregon, Washington, Wyoming	29,000	26,000
Investigations of existing projects: Lower Yellowstone project, Montana, North Dakota	5,000	4,000
Total multi-State partly within the State	255,000	208,000
Grand total	389,000	284,000

[1] Does not include investigations of developments in connection with the Missouri River Basin project.
[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Nevada, fiscal years 1951 and 1952

Investigations	Estimated expenditures—	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Project investigations:		
Lower Colorado River Basin:		
Fort Mohave project	$27,000	$35,000
Moapa Valley project	20,000	6,000
Lahontan Basin: Humboldt project	24,000	
Investigations of existing projects: Newlands project	14,000	7,000
Total wholly within the State	85,000	48,000
Multi-State investigations partly within the State:[1]		
Reconnaissance:		
United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Carson River project, California, Nevada	23,000	6,000
Washoe project, California, Nevada	34,000	
Basin studies: Lower Colorado River Basin, Arizona, California, Nevada, New Mexico, Utah	30,000	20,000
Project investigations: Lahontan Basin, Washoe project, Nevada, California	7,000	60,000
General engineering and research: Region 3, Arizona, California, New Mexico, Nevada, Utah	24,000	21,000
Total partly within the State	253,000	209,000
Grand total	338,000	257,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in New Mexico, fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Basin surveys: New Mexico water resources	[1] $2,000	
Project investigation:		
Rio Grande Basin:		
Carlsbad project	10,000	
Rio Grande project, Caballo power plant	4,000	
Middle Rio Grande project	17,000	
Upper Colorado River Basin:		
Hammond project	3,000	
South San Juan project	54,000	$50,000
Vermejo project	1,000	
Advance planning:		
Middle Rio Grande project	298,000	258,000
Vermejo project		10,000
Investigations of existing projects: Carlsbad project	2,000	
Total wholly within the State	391,000	318,000
Multi-State investigations partly within the State: [2]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys:		
Arkansas-White, Red River Basin, Colo., N. Mex., Kans, Okla., Tex	338,000	250,000
Pecos River Basin, N. Mex., Tex	12,000	2,000
Lower Colorado River Basin, Ariz., Calif., N. Mex., Nev., Utah	30,000	20,000
Project investigations:		
Central Arizona project, Arizona, New Mexico	176,000	159,000
Colorado River storage project, Colorado, New Mexico, Utah, Wyoming, Arizona	228,000	334,000
Pine River project extension, Colorado, New Mexico	7,000	
Animas-La Plata project, Colorado, New Mexico	51,000	50,000
San Juan-Chama project, New Mexico, Colorado	101,000	175,000
Investigations of existing projects: Rio Grande project, New Mexico, Texas	37,000	
General engineering and research:		
Region 3, Arizona, New Mexico, California, Nevada, Utah	24,000	21,000
Region 5, Colorado, Kansas, New Mexico, Oklahoma, Texas	6,000	5,000
Total partly within the State	1,145,000	1,118,000
Grand total	1,536,000	1,436,000

[1] Includes $1,000 contributed by State of New Mexico.
[2] The estimated expenditures shown for multi-State investigations are the total amount to be spent on the investigations in all of the States involved.

Program of general investigations in North Dakota,[1] fiscal years 1951 and 1952

Investigations	Estimated expenditures—	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State: Investigations of existing projects, Buford-Trenton project	$3,000	$3,000
Multi-State investigations partly within the State: [2] Investigations of existing projects, Lower Yellowstone project, Montana, North Dakota	5,000	$4,000
Total	8,000	7,000

[1] Does not include investigations of developments in connection with the Missouri River Basin project
[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Oklahoma, fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Basin surveys: Washita River Subbasin, Okla	$9,000	
Project investigations:		
Canton project	4,000	
Fort Gibson project	1,000	
Total wholly within the State	14,000	
Multi-State investigations partly within the State: [1]		
Basin surveys: Arkansas-White, Red River Basin, Colo., Kans., N. Mex., Okla., Tex	338,000	$250,000
General engineering and research: Region 5, Colorado, Kansas, New Mexico, Oklahoma, Texas	6,000	5,000
Total partly within the State	344,000	255,000
Grand total	358,000	255,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Oregon, fiscal years 1951 and 1952

Investigations	Estimated expenditures—	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Basin surveys:		
Northern Pacific Basin:		
Umpqua River Basin	$1,000	$2,000
Rogue River Basin	3,000	
Project investigations:		
Columbia River Basin:		
Yamhill project	1,000	1,000
Grande Ronde project	41,000	10,000
Upper Burnt River project		15,000
Jordan Valley project	1,000	
Baker project, upper division	12,000	5,000
Baker project, Wolf Creek division	1,000	1,000
Pendleton project	20,000	2,000
Butter Creek project	3,000	1,000
Crooked River project	6,000	
Deschutes project, domestic water system [1]	12,000	
Deschutes project, supplemental storage	55,000	62,000
Tualatin project	6,000	1,000
Wapinitia project	1,000	1,000
Willamette Valley storage utilization project	12,000	10,000
Paulina project	1,000	1,000
Post project	1,000	1,000
Molalla project	1,000	
The Dalles project, eastern division	2,000	2,000
Northern Pacific Basin:		
Rogue River Basin project:		
Talent division	63,000	82,000
Medford division	38,000	2,000
Merlin division	15,000	52,000
Illinois Valley division	3,000	28,000
Applegate Valley division	2,000	1,000
Union Peak division	22,000	28,000
Grants Pass project, Savage Rapids Dam	14,000	
Lahontan Basin: Goose Lake project	9,000	
Investigations of existing projects:		
Owyhee project	2,000	
Vale project	1,000	1,000
Umatilla project	2,000	2,000
Total wholly within the State	351,000	311,000

[1] Includes $7,500 contributed by local interests.

Program of general investigations in Oregon, fiscal years 1951 and 1952—Continued

Investigations	Estimated expenditures— Fiscal year 1951	Fiscal year 1952
Multi-state investigations partly within the State: [2]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	$135,000	$102,000
Basin Surveys.		
Columbia River Basin, Idaho, Mont., Oreg., Wash., Wyo	76,000	52,000
Klamath River Basin, Calif., Oreg	54,000	100,000
Snake River Basin, Oreg., Idaho	68,000	98,000
Project investigations:		
Milton-Freewater project, Washington, Oregon	24,000	58,000
McNary gravity project, Oregon, Washington	4,000	
Hells Canyon project, Oregon, Idaho	70,000	114,000
Investigations of existing projects: Klamath project, California, Oregon	19,000	12,000
General engineering and research: Region 1, Idaho, Montana, Oregon, Washington, Wyoming	29,000	26,000
Total partly within the State	479,000	562,000
Grand total	830,000	873,000

[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in South Dakota,[1] fiscal years 1951 and 1952

Investigations	Estimated expenditures Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State: Investigations of existing projects, Belle Fourche project	$6,000	$6,000
Multi-State investigations partly within the State	None	None
Total	6,000	6,000

[1] Does not include investigations of developments in connection with the Missouri River Basin project;

Program of general investigations in Texas, fiscal years 1951 and 1952

Investigations	Estimated expenditures— Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Basin surveys: Gulf Basin	$47,000	$100,000
Project investigations:		
Canadian River project	13,000	
West Texas project	48,000	15,000
Brownwood division	5,000	
Lower Nueces River project	67,000	
Nueces River power development	56,000	35,000
Balmorhea project	5,000	
Falcon (IBWC) project	3,000	
Advance planning: Canadian River project		100,000
Total wholly within the State	244,000	250,000
Multi-State investigations partly within the State: [1]		
Basin surveys:		
Arkansas-White, Red River Basin, Colo., Kans., N. Mex., Okla., Tex.	338,000	250,000
Pecos River Basin, N. Mex., Tex.	12,000	2,000
General engineering and research: Region 5, Colorado, Kansas, New Mexico, Oklahoma, Texas	6,000	5,000
Investigations of existing projects: Rio Grande project, New Mexico, Texas	37,000	
Total multi-State partly within the State	393,000	257,000
Grand total	637,000	507,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Utah, fiscal years 1951 and 1952

Investigations	Estimated expenditures Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Project investigations:		
Lower Colorado River Basin:		
Dixie project	$13,000	$6,000
Central Utah project	173,000	125,000
Emery County project	7,000	
Gooseberry project	6,000	
Investigations of existing projects: Sanpete project	5,000	2,000
Advance planning: Weber Basin project	[1] 425,000	341,000
Total wholly within the State	629,000	474,000
Multi-State investigations partly within the State: [2]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys: Lower Colorado River Basin, Arizona, New Mexico, California, Nevada, Utah	30,000	20,000
Project investigations:		
Bonneville Basin: Bear River project, Idaho, Utah	130,000	80,000
Upper Colorado River Basin:		
Colorado River storage project, Colorado, New Mexico, Utah, Wyoming, Arizona	228,000	334,000
Dolores project, Colorado, Utah	4,000	
General engineering and research: Region 3, Arizona, California, Nevada, New Mexico, Utah	24,000	21,000
Total partly within the State	551,000	557,000
Grand total	1,180,000	1,031,000

[1] Includes $21,000 contributed by State of Utah.
[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Washington, fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Reconnaissance:		
Columbia River Basin:		
Sanpoil-Kettle River project	$1,000	----
Hartline project	1,000	----
Okanogan River Basin	3,000	----
Project investigations:		
Columbia River Basin:		
Greater Wenatchee project	8,000	$9,000
Upper Horse Heaver project	1,000	1,000
Foster Creek project	15,000	6,000
Yakima project, supplemental storage	11,000	2,000
Dayton project	13,000	60,000
Walla Walla project	----	1,000
Northern Pacific Basin: Sequim project	9,000	1,000
Advance planning: Yakima project, Kennewick division	177,000	44,000
Investigations of existing projects:		
Yakima project, Sunnyside division	1,000	5,000
Okanogan project	3,000	----
Total wholly within the State	243,000	129,000
Multi-State investigations partly within the State:[1]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys:		
Columbia River Basin, Idaho, Mont., Oreg., Wash., Wyo	76,000	52,000
Snake River Basin, Idaho, Oreg	68,000	98,000
Project investigations:		
Columbia River Basin:		
Rathdrum Prairie project, Idaho, Washington	42,000	16,000
Milton-Freewater project, Washington, Oregon	24,000	58,000
McNary Gravity project, Washington, Oregon	4,000	----
General engineering and research: Region I, Idaho, Montana, Oregon, Washington, Wyoming	29,000	25,000
Total partly within the State	378,000	352,000
Grand total	621,000	481,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Program of general investigations in Wyoming,[1] fiscal years 1951 and 1952

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Project investigations:		
Upper Colorado River Basin:		
Sublette project	$127,000	$102,000
LaBarge project	12,000	
Seedskadee project	7,000	
Lyman project	4,000	
Missouri River Basin: LaPrele unit	30,000	
Investigations of existing projects:		
Shoshone project	7,000	8,000
Riverton project	9,000	15,000
Total, wholly within the State	196,000	125,000
Multi-State investigations partly within the State:[2]		
Reconnaissance: United western investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	135,000	102,000
Basin surveys: Columbia River Basin, Idaho, Montana, Oregon, Washington, Wyoming	76,000	52,000
Project investigations:		
Colorado River storage project, Colorado, New Mexico, Utah, Wyoming, Arizona	228,000	334,000
Yampa River project, Colorado, Wyoming, Savery-Pot Hook unit	46,000	7,000
Teton Basin project, Idaho, Wyoming	9,000	2,000
General engineering and research: Region 1, Idaho, Montana, Oregon, Washington, Wyoming	29,000	26,000
Total, multi-State partly within the State	523,000	523,000
Grand total	719,000	648,000

[1] Does not include investigations of developments in connection with the Missouri River Basin project, except for $30,000 allotted to LaPrele unit in fiscal year 1951.

[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

ARIZONA

Central Arizona Project, Arizona, and New Mexico

PROJECT INVESTIGATIONS

For a detailed description of the project see Project Planning Report No. 3-8b.4-2 and House Document No. 136, Eighty-first Congress, first session. Both are on the subject of the central Arizona project.

The main object of the central Arizona project is to furnish supplemental water, principally from the Colorado River, to land on the flood plains of the Gila River and some of its tributaries upstream from Gillespie Dam. The project will make use of power heads for the development of hydroelectric power needed for project pumping and for general commercial use; it will supply Tucson with additional municipal water; it will distribute available water to better advantage by exchange of water rights; and it will produce benefits from sediment retention, flood control, salinity control, preservation of fish and wildlife, and the promotion of recreation. The plan is to pump water from Lake Havasu on the Colorado River to a 235-mile lined canal about a thousand feet higher, thence carry the water in the lined canal to Granite Reef Dam, about 25 miles easterly from Phoenix, for distribution, or to the nearby potential McDowell Dam for storage pending distribution; to carry water from Sahuaro Reservoir on Salt River to Picacho Reservoir on the Gila plain 13 miles southerly from Florence, thereby to provide more water where needed through exchange of water rights, to effect economics in the Safford area by consolidation of the present distribution systems; to make more water available to the upper Gila River system through storage of water on the Gila and through exchange of water rights; to provide flood control, storage for irrigation and some power by building a dam on the Buttes site on the Gila River about 10 miles upstream from Florence; to provide Tucson with additional municipal water from a reservoir to be created on the San Pedro River 12 miles southwest of Tombstone; and to provide for power and additional storage by enlarging Horseshoe Reservoir which is 30 miles upstream from the mouth of the

Verde River. A large amount of power would be developed at the potential Bridge Canyon Dam on the Colorado River at the head of Lake Mead to augment Southwest power and to considerably more than offset any power taken by this project for pumping. To prolong the life of Bridge Canyon Reservoir, sediment from the Little Colorado River would be detained at the potential Coconino Reservoir near Cameron, Ariz., and sediment from the Colorado River above the Utah line will be retained by the potential Glen Canyon Dam of region 4, the later dam not a feature of the central Arizona project.

Colorado River Storage Project, Glen Canyon Unit, Arizona-Utah

PROJECT INVESTIGATIONS

Glen Canyon Dam site, located on the Colorado River 15 miles upstream from Lees Ferry, Ariz., is the final regulatory control point in the upper Colorado River Basin. Without regulation on lower San Juan River or on the Colorado River proper above Green River confluence, storage must be provided not only for the large unregulated flows of these two branches of the system, but also for Green River inflows below the proposed Gray Canyon Reservoir. Present critical power needs in both the upper and lower basins of the Colorado River assure a ready market for its large potential production. Recreation benefits will accrue with access road to the dam and reservoir. Other potential benefits include flood control, fish and wildlife conservation, and regulation and sediment storage for existing and potential downstream developments.

General Power Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to formulate a regional plan and program for the maximum economic development and utilization of hydroelectric resources of the area. In order to achieve this purpose it is necessary to unify on a region-wide basis the power planning for the various projects, both authorized and proposed, so that the power features of each project will be developed as an integral part of the entire regional system, coordinated with the plans and efforts of other power producing agencies in the Southwest.

These studies involve system and intersystem planning, power site and capacity investigations, determination of transmission system requirements, coordination of plants and systems, and collection and analysis of power market data, as well as the preparation and interchange of technical information incidental to the plans of Federal and State agencies and utilities in region 3.

Gila Project, Arizona

INVESTIGATIONS OF EXISTING PROJECTS

The North Gila Valley unit of the Gila project is located north of the Gila River and east of the Colorado River near Yuma, Ariz. Negotiation of a repayment contract with the North Gila Valley irrigation district has been delayed because of failure to reach agreement with the State of Arizona for the exclusion of certain lands owned by the State. The existence of large holdings in private ownerships and under lease from the State of Arizona within the district boundaries will necessitate special investigations and study to determine suitable means for securing compliance with the acreage limitation provisions of reclamation law, following execution of the repayment contract.

Glen Canyon Unit, Colorado River Storage Project, Utah and Arizona

PROJECT INVESTIGATIONS

The Bureau has foreseen for many years the strategic importance of a reservoir at the downstream end of the upper Colorado River Basin. Such a reservoir would serve as a means for the upper basin to fulfill its obligations under the Colorado River compact. A dam in Glen Canyon, 15.3 miles upstream from Lees Ferry, Ariz., would create such a reservoir, and in addition furnish one of the outstanding power possibilities on the Colorado River; it would in addition store sediment which would otherwise greatly shorten the useful life of the potential Marble Canyon and Bridge Canyon power reservoirs.

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Hassayampa Project, Arizona

PROJECT INVESTIGATIONS

The Hassayampa project would irrigate 7,000 acres of land 35 miles northwest of Phoenix, Ariz. The land is class 1 and the conditions for a favorable agriculture compare with those around Phoenix. Erratic streamflow of the Hassayampa River, the source of water supply, would make a large holdover capacity necessary in the potential Box Canyon Reservoir. In the project report of February 1948, the authorization of the project was not recommended at the time. The high cost of the reservoir with large holdover capacity and of the main canal leading along the Hassayampa River made repayment impossible in the usual 40-year interest-free period. Although the benefit to cost ratio was 1.59 to 1, only 27 percent of the construction cost would be repaid in 40 years. The report recommended (1) that further consideration of authorization be deferred until the economic need of the Nation, lower construction costs, further information on the project, or other developments may justify reconsideration; and (2) that the operation of the gaging stations at Box Canyon and Morristown be continued by the Geological Survey.

Holbrook Project, Arizona

PROJECT INVESTIGATIONS

The potential forks reservoir on the Little Colorado River above Woodruff, Ariz., could store water for irrigation of possibly 2,000 acres of land in the vicinity. However, the suitability of the water for continued irrigation use is in doubt. Also the reservoir capacity would be reduced continually by receiving the sediment of the Little Colorado River. Before more extensive investigations, the Bureau wishes to be assured of the quality of the water of the Little Colorado River for irrigation use and the allowances to make for sediment storage. Therefore, present studies are being limited to cooperative investigations being made by the Geological Survey for quality of water and sediment content observations on the Little Colorado River at Woodruff.

Lower Colorado River Basin, Arizona, California, Nevada, New Mexico, and Utah

BASIN SURVEYS

The Bureau is undertaking, as time permits, a comprehensive study of the water supply of the lower Colorado River Basin to parallel a similar study already made for the upper basin and embodied in the report, "Final Report, Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, November 28, 1950." The data developed for the lower basin will be basic for general planning purposes involving water resources; it will furnish a factual basis for examination of issues arising from the Colorado River compact and should be helpful in resolving controversial points.

Marble Canyon Project, Arizona

PROJECT INVESTIGATIONS

There is an undeveloped power potentiality on the Colorado River between Glen Canyon dam site 15.3 miles upstream from Lees Ferry, Ariz., and the north boundary of Grand Canyon National Park, about 52 river miles below Lees Ferry, where the Colorado River falls about 340 feet. The Marble Canyon project investigation is being made to evolve plans to develop the power project to help supply hydroelectric power to the power-deficient Southwest.

The drilling of the Marble Canyon Dam site is a major undertaking because of the rugged terrain. To gain access to the Colorado River at Marble Canyon an existing road was improved for about 12 miles and extended the same distance to the rim of the canyon in the vicinity of Mile 39 (downstream from Lees Ferry). To transport men and equipment from the road to the Colorado River, a 3,700-foot cableway was installed from the high rim to the rim of the inner gorge, and a second cable was installed from the rim of the inner gorge to river level. Camps were set up at the ends of the main cable.

Salt River Project, Arizona

INVESTIGATIONS OF EXISTING PROJECTS

The Salt River project, an old reclamation project, encompasses 243,000 irrigable acres in the south-central portion of Arizona. General investigation funds have been provided for landownership studies on this project encompassing an examination of the extent of compliance with the 160-acre limitation provision of reclamation law, and the formation of procedures for bringing about full compliance. The Salt River Valley Water Users' Association has cooperated in the study and in the development of enforcement procedures which are nearing completion.

Sedimentation Studies Including Quality of Water Studies, Arizona, California, Nevada, New Mexico and Utah

GENERAL ENGINEERING AND RESEARCH

Since the Colorado River and its tributaries carry unusually large quantities of silt, it becomes necessary to determine these quantities adequately for design purposes in order that Bureau reservoirs may have ample capacity, silt considered, and to estimate the probable useful life of reservoirs both constructed and prospective. Future reservoirs such as Glen Canyon, Marble Canyon, Coconino, Bridge Canyon and reservoirs on the Dixie project must all be designed with large allowances in capacity for silt retention. The Geological Survey has been carrying on a cooperative program of silt sampling on the Colorado River at Lees Ferry, Ariz. the Little Colorado River at Cameron, Ariz., and the Virgin River at Littlefield, Ariz. Quality of water determinations are also made as an incident of this work

Snowflake Project, Arizona

PROJECT INVESTIGATIONS

The Snowflake project, situated about 30 miles south of Holbrook, Ariz., would consist of 2,200 acres of land now irrigated and additional new lands to be irrigated given in the report as 4,500 acres. The amount of new land irrigated would hinge upon the dependable water supply. In preparing the report the existing water supply records were inadequate; resort had to be made to indirect methods of estimating part of the record.

The Bureau reported unfavorably on the project in August 1947 because of the project's inability to pay the high construction costs, but the report further recommended that the question of authorization be left open for such time as lower construction costs, the economic need of the Nation, further information, or other developments might justify reconsideration. The present project has been settled and irrigated over 70 years. With a group of irrigation farmers watching such matters, it is not believed that the question of authorization will be allowed to slumber but will be raised again when construction costs or other circumstances are more favorable. In a case of reconsideration fully satisfactory water records would be invaluable; the amount of new land which can be irrigated and serve as a base for construction charges is dependent upon a close appraisal of the water supply. Such records would cost only a fraction of what they are worth in a reappraisal.

Storm Studies—Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

For determination of size of spillways, and freeboard of dams, and allowances to make for flood heights and flood damages, the engineer depends upon the results of storm analyses. The Bureau of Reclamation has an agreement with the Army at Commissioner level to divide up the field of storm studies so that no duplication will result and so that each agency will have the results of the other's work. The regional office carries on such studies in Boulder City.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand, there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand, there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the United Western Investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

Winslow Project

PROJECT INVESTIGATIONS

Lands in the valley of the Little Colorado River near Winslow, Ariz., can be irrigated from Clear Creek and Chevelon Fork, tributaries of the Little Colorado River. The upper reaches of these tributaries have water of good quality for irrigation and municipal use. Two reservoir sites appear suitable for storage of this water. To determine possible yields at the reservoir sites the Geological Survey has measured on a cooperative basis the flow of Chevelon Fork below Wildcat Canyon and Clear Creek below Willow Creek.

Yuma Auxiliary Project, Arizona

INVESTIGATIONS OF EXISTING PROJECTS

The Yuma auxiliary project, as reduced by the act of June 13, 1949, is a pumping project of 3,305 acres on the Yuma Mesa above the valley division of the Yuma project in Arizona. Contract negotiations are actively under way for delivery of water to the project through the facilities of the Gila project and for improvement of the existing distribution system. Investigations are in progress to make plans for rehabilitation and betterment of this existing project. The betterment work will consist of replacement of farm turnouts, main canal and lateral checks and other structures; relocation of certain laterals and provision for increased capacity in laterals.

Yuma Mesa Division, Gila Project, Arizona

INVESTIGATIONS OF EXISTING PROJECTS

The North and South Gila Valleys which are included in the Yuma Mesa Division, lie on both sides of the Gila River near its confluence with the Colorado and contain about 18,000 acres of land, most of which is in private ownership or under jurisdiction of the State of Arizona. Delivery of water to the North Gila Valley through the facilities of the Gila project is expected to be effected during fiscal year 1951 upon execution of a pending repayment contract with the North Gila Valley irrigation district. Lands in the South Gila Valley are presently irrigated primarily by pumping from underground storage, although a number of private landowners in the district are negotiating with the United States for delivery of project water to a limited acreage of land adjacent to or near the Gila gravity main canal. Recently the water table has been rising in the South Gila Valley and the Bureau is making investigations to determine the cause and probable solution to existing and potential difficulties. Investigations will be made of the requirements of rehabilitation and betterment of the existing distribution system in the North Gila Valley district.

Yuma Project, Reservation Division, Arizona and California

INVESTIGATIONS OF EXISTING PROJECTS

The Yuma project is located on both sides of the Colorado River in the general vicinity of the Mexican boundary. The Reservation Division, about one-half of which is Indian land, consists of 15,000 acres lying west of the Colorado River in California. Maintenance of irrigation structures was seriously neglected in the years of low farm income prior to the war and postponed during the war period because of the shortage of labor and materials. A survey of rehabilitation and betterment requirements is under way on the Reservation Division as a means of developing a program for consideration by the water users.

CALIFORNIA

Black Butte Unit, Stony Creek Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The project area is located in Glenn County, Calif., in the basin of Stony Creek, a tributary of the Sacramento River. The center of the project area is approximately 7 miles southwest of the city of Orland.

The purpose of this investigation is to determine the most economical plan to utilize the water to be stored in the proposed Black Butte Reservoir on Stony Creek for irrigation.

The Corps of Engineers was authorized by the Flood Control Act of 1944 to construct the Black Butte Reservoir on Stony Creek, for flood control and conservation. Due to the proximity of the project to the existing Orland reclamation project, which utilizes Stony Creek water, water made available by the proposed storage could be used as a supplement to the Orland project or to extend irrigation to an adjacent area of about 15,000 acres. As provided in the 1944 Flood Control Act, the Bureau of Reclamation would have responsibility for operation of and repayment to the Federal Government for irrigation facilities.

Cache Creek Basin, Calif.

BASIN SURVEYS

Cache Creek Basin comprises an area of about 1,200 square miles located principally in Lake and Yolo Counties in the southwestern part of Sacramento River Basin. The purpose of this investigation is to examine means for beneficially using the surplus waters of Cache Creek Basin in an integrated development for irrigation, power generation, and other associated uses in Lake and Yolo Counties, and other areas within Central Valley Basin. Prospective future irrigators in Lake and Yolo Counties have demonstrated a definite interest in further development of Cache Creek Basin water supplies through local organization and representatives. Considerable preliminary planning work has been done in the basin by the Bureau of Reclamation; and the Corps of Engineers, Department of the Army, are concluding an investigation of flood control which, according to advance information, will demonstrate the feasibility of conservation development in multiple-purpose reservoirs which would constitute major units in a flood-control plan for the basin. Irrigable land within the basin far exceeds the presently developed water supply, and a resumption of investigations will be desired.

Carson River Project, California and Nevada

RECONNAISSANCE

The Carson River project is located in west central Nevada and is situated within what is locally known as the Upper Carson Valley. The East and West Forks of the Carson River have their confluence in the valley as they emerge from the eastern slope of the Sierra-Nevada Range.

The purpose of the investigation is to determine the potentialities of conserving water by upstream regulation and consequently, improving irrigation practices to obtain greater utilization of land and water resources in the area. About 30,000 acres are presently inadequately irrigated and are devoted for the most part to native marsh pastures because of an inadequate late season water supply and the swamp conditions produced by the excessive application of water when it it avail-

able in the spring season. The swamp conditions in the lower portion of the valley result in excessive consumptive use of water thus preventing full water and land utilization. A reasonably efficient water use in the lower and upper Carson River areas is expected to allow greater beneficial use of the land and water resources. The reconnaissance investigation is to inventory and analyze the various potentialities and to formulate the most desirable basin-wide plan of development for consideration by local and State interests. If found justifiable a detailed investigation of the plan would be undertaken.

Central Valley Basin, Calif.

BASIN SURVEYS

The Central Valley Basin occupies about one-third of the area of California. In it are located over 3,500,000 acres of irrigated land, much of which is in need of supplemental water, and 3,000,000 acres of additional irrigable land which can be irrigated by the construction of the necessary reservoirs, canals, pumping plants, power facilities, and related works. Investigations of various subbasins and specific projects in the Central Valley are under way and are included in the Bureau of Reclamation's investigation program. However, because the streams of the basin are so interrelated and because irrigation of the lands will require a a comprehensive coordinated system of works, in order to deliver water from areas of surplus supply to areas of deficiency, investigations of the basin as a whole are essential to insure that individual features fit into a well-rounded over-all basin plan.

Clikapudi Unit, Sacramento River Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The project area is located in Shasta County, Calif., in the basin of the Sacramento River. The center of the project is approximately 5 miles east of Redding.

The purpose of this investigation is to determine the feasibility of supplying water from the Sacramento River to 5,000 acres of land in need of a supplemental supply and to about 15,000 acres of new land.

Feather River Basin, California

BASIN SURVEYS

The project area is located in northeastern California. The Feather River in point of runoff is the largest tributary of the Sacramento River. The center of the project is approximately 50 miles northeast of the city of Oroville.

The purpose of this investigation is to determine the possibilities of water storage on the Feather River for irrigation, power, flood control, and fish propagation, coordinated with existing and proposed features of the comprehensive plan for water resources development for the Central Valley Basin.

The potential Feather River storage would provide water for the complete irrigation of the Feather River service area as well as the export of excess water to thousands of acres in the Sacramento and San Joaquin Valleys. A large potential power development would help alleviate the serious power shortage in northern California and would provide revenue to assist the irrigators and other beneficiaries in repaying irrigation construction costs. Sufficient flood-control space would be included in the plan to eliminate most of the damage caused by devastating floods in the area subject to Feather River flooding. By coordination with other features of the Central Valley project, navigation, salinity control, and other benefits will be increased.

Folsom Canals Unit, American River Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The project area is located in Placer, Sacramento, and San Joaquin Counties, Calif.

The purpose of the investigation would be to determine the area of such lands that can be served a supply of irrigation and municipal water from the Folsom Reservoir which is authorized for construction on the American River, and to determine the water requirements of these lands and the size and cost of the

canals that would be necessary to deliver the water. The principal features would be a canal running from Folsom Dam northward through Placer County, and another canal diverting from the Numbus Afterbay Dam, and running southward through Sacramento and San Joaquin Counties.

General Power Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to formulate a regional plan and program for the maximum economic development and utilization of hydroelectric resources of the area. In order to achieve this purpose it is necessary to unify on a region-wide basis the power planning for the various projects, both authorized and proposed, so that the power features of each project will be developed as an integral part of the entire regional system, coordinated with the plans and efforts of other power-producing agencies in the Southwest.

These studies involve system and intersystem planning, power site and capacity investigations, determination of transmission system requirements, coordination of plants and systems, and collection and analysis of power-market data, as well as the preparation and interchange of technical information incidental to the plans of Federal and State agencies and utilities in region 3.

Georgetown Divide Unit, American River Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The project area is located in north central El Dorado County, Calif., on the ridge between Middle Fork and South Fork of American River. The center of the project area is about 10 miles east of the city of Auburn.

Local irrigation interests, who have a presently inadequate water supply have asked the Bureau of Reclamation to make an investigation leading toward a solution of their water problems, but lack of funds and personnel have prevented the undertaking of this work.

Klamath River Basin, Oreg.,and Calif.

BASIN SURVEYS

The Klamath River Basin is located in northern California and southern Oregon. The major potential agricultural areas are in the upper basin and development of hydroelectric power is possible at a number of places along the main stream and tributaries. The purpose of this investigation is to determine and inventory the water resources, classify and locate the irrigable lands, and determine the potential agricultural, power, widlife, and other multiple-purpose utilization of the resources, together with the economic feasibility of the developments. The basic objective is to formulate a basin-wide plan for the conservation and use of the water resources of the Klamath River Basin, which will serve as a framework for the individual features.

Klamath Project, Oregon and California

PROJECT INVESTIGATIONS

The Klamath project is located on the border line between Oregon and California. The purpose of this investigation is to analyze project repayment arrangements as they are affected by needed changes of irrigation district and individual pumping contracts, the need and alternate means for providing facilities for additional potential development areas, and other factors incident to ultimate development of the project. Some contract readjustments have been made and others are pending. Requests continue to be received for contracts covering additional areas.

A major purpose is to determine the location and extent of such potential irrigable lands and what facility additions or changes are needed to serve areas which can be economically irrigated. Much of this potential area is receiving some water under rental agreements, awaiting the time when a permanent contract and facility can be provided. Analysis of the entire project is necessary in order that equitable repayment arrangements may be established covering current needs and permitting full project development to the extent of available land and water.

Lower Colorado River Basin, Ariz., Calif., Nev., N. Mex., and Utah

BASIN SURVEYS

The Bureau is undertaking, as time permits, a comprehensive study of the water supply of the lower Colorado River Basin to parallel a similar study already made for the upper basin and embodied in the report, Final Report, Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, November 28, 1950. The data developed for the lower basin will be basic for general planning purposes involving water resources; it will furnish a factual basis for examination of issues arising from the Colorado River compact and should be helpful in resolving controversial points.

North Fork Kings Unit, Kings River Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The North Fork Kings unit is located on Kings River in the Sierra Nevada east of Fresno, Calif.

The purpose of the investigation is to examine the full potentialities of this area for power production. On the basis of studies of certain dams and related power plants to date, it is anticipated that development of the area will constitute a valuable supplement to the Central Valley project by furnishing electrical energy for project pumping and providing a source of revenue to help defray costs allocated to existing and proposed irrigation works. It will also provide low-cost electrical energy for commercial distribution in a power-deficient area. The final report on this Unit will examine the engineering and economic feasibility of the full power potential of the North Fork Kings River.

Pajaro River Basin, Calif.

BASIN SURVEYS

The Pajaro River flows into the Pacific Ocean at Watsonville, Calif. The river basin is situated in Santa Clara, San Benito, and Monterey Counties. The city of Hollister is the county seat of San Benito County and is located in the center of a large irrigated agricultural area, mostly planted in orchards and truck vegetables, including flower and vegetable seeds.

The purpose of the investigation is to ascertain the water requirement for a supplemental supply to presently irrigated land and to determine the water resources available to meet this demand and to supply adjacent new land where feasible.

Due to the overexpansion of irrigation development and several successive years of less-than-average rainfall, the ground-water level is being progressively lowered because of overpumping. It has been proposed that reservoirs be constructed on San Benito River to impound floodwaters for later release to replenish the storage in the underground basin.

Palo Verde Mesa Coordinating Investigations, California

PROJECT INVESTIGATIONS

In March 1947, the Bureau of Reclamation and the Bureau of Indian Affairs made a joint report to the Secretary of the Interior recommending pumping as the permanent solution of the diversion problem of the Palo Verde irrigation district, the lands of which were supplied with water from the Colorado River. The clear water released from Government reservoirs upstream had caused the Colorado River to deepen its course leaving the district intake perched above satisfactory diversion level. As a war measure to save the crops of the district, Congress authorized and the Bureau built a temporary rock diversion weir to raise the river to a satisfactory diversion level.

Rogue River Basin, Oregon and California

BASIN SURVEYS

This investigation is to examine means for beneficial use of the waters of the Rogue River Basin in an integrated development for irrigation, recreation, fish and wildlife, power generation, and other uses, and to determine to what extent

flood control is possible. The Rogue River Basin is located in the southwestern part of Oregon, and it includes within its boundaries both Jackson and Josephine Counties and a large part of Curry County. Medford, Grants Pass, and Ashland are the main towns. About 64,000 acres of land in the basin are now irrigated, but supplemental water is needed on much of this land. The investigation has shown that an additional 73,540 acres of dry land can be irrigated, and 40,300 acres of land now irrigated can be supplied with needed supplemental water. The waters of the basin are susceptible to control for the reduction of flood damage and to use for generation of hydroelectric power.

Rogue River Basin Project, Oregon and California, Applegate Valley Division

PROJECT INVESTIGATIONS

The purpose of the project is to investigate means for irrigating lands in or adjacent to the Applegate River Valley and possible means for controlling floods of the Applegate River. The rapid expansion of the population of southern Oregon in recent years and depletion of timber resources resulted in a pressing need for expansion of agriculture through additional irrigation. The project irrigation possibilities include supplemental irrigation of 9,500 acres of land now receiving an insufficient supply of water and irrigation of an additional 7,000 acres of dry land. Needed amounts of water could be obtained by storing winter runoff of the Applegate River. Floods could be partially controlled by a multiple-purpose (irrigation and flood control) storage reservoir on the Applegate River. The Applegate Valley project is located in Josephine County, Oreg., in the southern part of the Rogue River Basin.

Russian River Basin, Calif.

BASIN SURVEYS

The project area is located in Mendocino and Sonoma Counties, Calif., in the basin of the Russian River. A preliminary investigation by the Bureau of Reclamation was completed by the issuance of a basin report dated January 1945. The plan of irrigation development as outlined did not gain local approval, and the local interests turned to the Corps of Engineers for a plan of development principally for flood control and recreation. A corps report, Survey Report for Flood Control and Allied Purposes on Russian River, Calif. was presented for review and consideration by interested agencies in 1949. Public Law 516, Eighty-first Congress, approved May 17, 1950, authorized the Corps of Engineers to construct this project for flood control, recreation, and irrigation purposes with provision that section 8 of the 1944 Flood Control Act should apply. Inasmuch as a minor irrigation development is included in the plan of the Corps of Engineers, the Bureau of Reclamation will be required to make certain studies relative to this irrigation development, in conjunction with the corps' activities.

Sacramento River Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The project area is located in the counties of Tehama, Glenn, Butte, and Colusa, Calif., in the basin of the Sacramento River.

The purpose of this investigation is to determine the most economical plan to irrigate about 200,000 acres of rich but dry lands in the Sacramento Valley.

The project is a logical development in the comprehensive plan of utilizing the resources of the Central Valley Basin. The area is capable of increasing the productive wealth of the Nation, as well as establishing locally a more stable economy and creating farm homes for hundreds of families, which is greatly needed to keep pace with the tremendous increase in Western States' population since World War II.

The project is comprised of two principal divisions, namely, the Chico canal and pumping plant on the east side of the Sacramento River involving approximately 23,000 acres of irrigable land and the Tehama-Colusa canal and diversion dam together with the Tehama canal and pumping plant on the west side of the Sacramento River involving approximately 183,000 acres of irrigable land. The total irrigable area for the project is about 206,000 acres. The water supply for the project could be obtained for an interim period from the existing Shasta

Reservoir of the initial Central Valley project and by exchange from the Folsom Reservoir now under construction on the American River by the Corps of Engineers. The water supply would later need to be augmented for ultimate development by water from the Trinity Reservoir or other proposed reservoirs in the comprehensive plan for the Central Valley.

San Diego Project, Metropolitan Connection Enlargement, California

PROJECT INVESTIGATIONS

On April 25, 1949, a contract was executed between the Bureau and the San Diego County Water Authority. In this contract the Bureau agreed to investigate the cost of a second barrel which would parallel the constructed first barrel of the San Diego Aqueduct or deviate from it where the authority deemed it wise to investigate an alternate location. The estimated cost of such investigations was $50,000 of which the authority agreed to furnish half. The present aqueduct furnishes municipal and some irrigation water to San Diego and member organizations in the authority.

San Francisco Bay Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

H. R. 618 adopted during the Eightieth Congress, second session, and Public Law 356, Eighty-first Congress, first session, both provide for an investigation of the ultimate water requirements of the several counties that border on the San Francisco, San Pablo, and Suisun Bays in California, and of means for meeting those requirements. This investigation will involve extensive engineering, economic, and land-use studies in nearly all the area included in these counties.

San Luis Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The San Luis division includes over 700,000 acres of land on the west side of the San Joaquin Valley in Merced, Fresno, Kings, and Kern Counties.

The purpose of the investigation is to explore means of providing a source of water supply to supplement the rapidly lowering ground water level in the area. Over one-half of this area is now irrigated by pumping from the inadequate ground water supply. Since surface runoff from local streams is negligible, new sources of water supply must be provided in order to maintain the existing development and permit the irrigation of additional excellent agricultural lands.

San Luis Obispo County, Calif.

BASIN SURVEYS

San Luis Obispo County is situated along the Pacific coast north of Santa Barbara County and some 200 miles northwest of Los Angeles, Calif. Arroyo Grande is a small town on Arroyo Grande Creek and the land in the vicinity is largely devoted to truck vegetable farming. Paso Robles is located on the Salinas River near the southern boundary of Monterey County and at the north end of the upper Salinas Valley. San Luis Obispo is the county seat and is situated at the foot of the mountains about halfway between Arroyo Grande and Paso Robles. Water use in the Paso Robles and San Luis Obispo areas is largely for domestic and municipal purposes.

The purpose of the investigation is to ascertain the water resources and to develop a plan of utilization.

Santa Margarita Project, California

PROJECT INVESTIGATIONS

This project is in the vicinity of Fallbrook in San Diego County, Calif. Construction of a reservoir at the Deluz site would make the fullest practical use of the Santa Margarita River. The Navy Department has been investigating this reservoir site to supply the Marine base at Camp Pendleton with water. Also the reservoir could afford flood control for the lower river. The Bureau has been working on a report for a supplemental supply for irrigation and domestic use to

the Fallbrook Public Utility District. Recently the Navy Department advised that it would require all of the water that could be stored for the water supply for Camp Pendleton. Therefore, the Bureau will not make any additional investigation of this project.

Santa Maria Project, California

PROJECT INVESTIGATIONS

The Santa Maria Basin lies in the northern half of Santa Barbara County. The southern half of the county is occupied by the coastal area and Santa Ynez Basin. The city of Santa Barbara is on the coast of the Pacific Ocean and in the center of valuable lemon and walnut groves and other highly developed irrigated lands. An additional water supply for this area is being developed by the Bureau as the Cachuma project. The city of Santa Maria is located in the center of very rich land planted to truck produce, flower, and vegetable seeds, sugar beets, and other profitable crops. Water for irrigation is obtained from the underlying water-bearing gravels. The water levels are being lowered each year because of overdevelopment and overpumping and an additional water supply must be obtained to preserve the investment.

The purpose of the investigation is to determine the water resources and to develop a plan for utilization.

Sedimentation Studies Including Quality of Water Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

Since the Colorado River and its tributaries carry unusually large quantities of silt, it becomes necessary to determine these quantities adequately for design purposes in order that Bureau reservoirs may have ample capacity, silt considered, and to estimate the probable useful life of reservoirs both constructed and prospective. Future reservoirs such as Glen Canyon, Marble Canyon, Coconino, Bridge Canyon, and reservoirs on the Dixie project must all be designed with large allowances in capacity for silt retention. The Geological Survey has been carrying on a cooperative program of silt sampling on the Colorado River at Lees Ferry, Ariz., the Little Colorado River at Cameron, Ariz., and the Virgin River at Littlefield, Ariz. Quality of water determinations are also made as an ncident of this work.

Solano Project, California

PROJECT INVESTIGATIONS

The Solano project would supply water to lands in Solano County, Calif., including 78,000 acres now dry farmed and 5,000 acres in need of a supplemental supply. It would also provide water for municipalities in the area that are in urgent urgent need of additional water. The project includes Monticello Reservoir on the Putah Creek, with a capacity of 1,600,000 acre-feet, and the Putah south canal to deliver water to the lands of the service area and to the cities. An irrigation distribution system will also be included in the project.

Storm Studies—Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

For deterioration of size of spillways, and freeboard of dams, and allowances to make for flood heights and flood damages, the engineer depends upon the results of storm analyses. The Bureau of Reclamation has an agreement with the Army at Commissioner level to divide up the field of storm studies so that no duplication will result and so that each agency will have the results of the other's work. The regional office carries on such studies in Boulder City.

Trinity River Division, Central Valley Project (Ultimate Plan), of California

PROJECT INVESTIGATIONS

The project area is located in Trinity and Shasta Counties, Calif., the watershed draining into the Trinity River. The project area extends into the northern end of the Sacramento River basin. The center of the project is approximately 25 airline miles northwest of Redding, Calif.

The purpose of this investigation is to determine the possibilities for water storage on the Trinity River for irrigation, power, and other multipurpose uses, coordinated with existing and proposed features of the Comprehensive Plan for Water Resources Development for the Central Valley Basin.

The project works would include Trinity storage dam and reservoir, a smaller diversion dam and reservoir at Lewiston, two diversion tunnels, and three power plants. The Trinity Reservoir would make available about 1,000,000 acre-feet of irrigation water for use in the Central Valley where a supplemental water supply is needed. The power installations would total over 200,000 kilowatts and are included in the proposed features to help meet the urgent need for additional power in northern California. The reservoir would also provide water for irrigation, industrial, municipal, fish propagation, and other multipurpose uses in the Trinity River Basin.

Union Valley Unit, American River Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The project consists of a storage reservoir on Silver Creek, which is a branch of the South Fork of American River, and several power plants. This reservoir is in El Dorado County, about 22 miles east of Placerville.

The purpose of the investigation is to determine the amount of water storage available and the possibilities of power development with downstream reregulation of flows made possible by Folsom Reservoir, now under construction.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

Upper San Joaquin River Division, Central Valley Project (Ultimate Plan), California

PROJECT INVESTIGATIONS

The upper San Joaquin River division embraces a portion of the San Joaquin River above Friant Dam, where the river flows out of the Sierra Nevada in a southeasterly direction.

The purpose of the investigation is to develop a project plan for utilization of power-production potentialities of the western part of the drainage area. The western part of the upper San Joaquin River drainage area is one of the few remaining areas in the southern part of the Central Valley in which large hydroelectric power developments appear desirable. Part of the power potentialities on this river have been developed by the Pacific Gas & Electric Co. and the Southern California Edison Co. However, the interrelated development of the western portion of the basin above Friant Dam has not been constructed, nor have recent applications been made contemplating such construction, although they appear to be imminent. Feasible power developments on the San Joaquin River should

constitute valuable additions to the Central Valley project. Reregulatory storage possibilities of Millerton Lake, together with the fact of possesssion, by the Bureau, of water rights on the river, is expected to minimize opposition by irrigation interests.

Victor Project, California

PROJECT INVESTIGATIONS

In May 1941, the Army engineers issued a report on survey flood control, Mojave River, San Bernardino County, Calif. Nearly half of the costs of the Army flood-control plan were allocated to water conservation. This latter feature the Bureau investigated during fiscal year 1947, but the investigation was discontinued during early fiscal year 1948 for lack of funds before firm conclusions could be reached. The situation is that the Mojave River which flows north from the San Bernardino Mountains is subject to floods which cause serious economic loss. If this flood flow could be stored and released at appropriate times, or released slowly enough to recharge the underground basins north of Victorville, a considerable economic benefit could be realized from use of the water for irrigation, and flood damage would be prevented. The Bureau's investigation now in progress is to evolve plans for this potential development.

Washoe Project, California and Nevada

PROJECT INVESTIGATIONS

The area under investigation is located in California and Nevada in the basin of the Truckee River in the general vicinity of Reno, Nev.

Purpose of the investigation is to obtain greater utilization of the water and land resources in the basin. The construction of upstream storage is expected to provide greater power generation to replace insecure importations from plants in California west of the Sierra Nevada Range and a greater and more efficient use of the water for irrigation. The extent and means of accomplishing this purpose is to be determined by reconnaissance studies scheduled for completion in fiscal year 1951.

Washoe Project, California and Nevada

RECONNAISSANCE

The area under investigation is located in California and Nevada in the basin of the Truckee River in the general vicinity of Reno, Nev.

Purpose of the investigation is to outline potentialities for further irrigation and power development in the Truckee River Basin and other possible water uses. Partial regulation and use of the water resources of the basin have been accomplished by the construction of Boca Reservoir and the Lake Tahoe outlet dam by the Bureau of Reclamation and the Donner Lake and Independence Lake Reservoirs by private interests. Additional power development on the stream would replace insecure power imports from plants in California west of the Sierra Nevada Range and alleviate the serious power shortage in the area. Improvements in Truckee River water regulation would permit a more efficient use by downstream irrigators.

A number of plans of development have been proposed. These plans generally involve dams on Prosser Creek and Little Truckee River and releases from Boca Reservoir through a pressure tunnel to a power drop of 420 feet to Truckee River. These possibilities are being studied to determine the most desirable plan for additional development in the Truckee River Basin and whether a detailed project investigation would be justified.

Yuma Project, Reservation Division, Arizona and California

INVESTIGATIONS OF EXISTING PROJECTS

The Yuma project is located on both sides of the Colorado River in the general vicinity of the Mexican boundary. The reservation division, about one-half of which is Indian land, consists of 15,000 acres lying west of the Colorado River in California. Maintenance of irrigation structures was seriously neglected in the years of low farm income prior to the war and postponed during the war period because of the shortage of labor and materials. A survey of rehabilitation and betterment requirements is under way on the reservation division as a means of developing a program for consideration by the water users.

COLORADO

Animas-La Plata Project, Colorado and New Mexico

PROJECT INVESTIGATIONS

The project area is located in La Plata County in southwestern Colorado and San Juan County in northwestern New Mexico in the basin of the San Juan River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities for utilizing regulated flows of the Animas and La Plata Rivers, tributaries of the San Juan River for irrigation, production of power, protection from flood damage, and silt detention.

With this project, the waters of the Animas and La Plata Rivers would be fully utilized. Supplemental water could be furnished to 27,000 acres of insufficiently irrigated land in the La Plata River Basin and a full supply for about 86,000 acres of new land in that basin and adjacent areas, including 25,500 acres on the Navajo Indian Reservation in New Mexico.

Arkansas-White-Red River Basins (Upper Arkansas River Basin, Colo.-Kan.)

BASIN SURVEYS

In accordance with the provisions of the Flood Control Act of 1950 (Public Law 516, 81st Cong.) and the President's letter of May 19, 1950, pertaining to this act, the Bureau of Reclamation is participating in the preparation of a comprehensive report for the development and utilization of the national resources of the Arkansas-White-Red River Basins. Region 7 and upper Arkansas River area offices are responsible for the Bureau's participation in investigations in the upper Arkansas River Basin, from the headwaters of the Arkansas River in Colorado to Ellinwood, Kans., as directly contribute to the comprehensive survey for the Arkansas-White-Red Basins.

The plan, for the upper Arkansas River Basin, includes the potential Gunnison-Arkansas project consisting of transmountain diversions and other extensive features including reservoirs, canals, covered conduits, tunnels, pumping plants, hydroelectric power plants, and irrigation distribution systems; however, such diverted water would be used exclusively within the State of Colorado in accordance with the Colorado River compact. The many benefits of the basin plan will include new and supplemental irrigation water, hydroelectric power, flood control, silt retention, reduction of stream pollution, municipal water, recreation, wildlife protection and propagation, drainage, salinity control, and extensive industrial, commercial, and population growth. Ultimate development of the basin plan will provide irrigation possibilities for 640,000 acres and power capacity of nearly 700,000 kilowatts.

Blue-South Platte Project, Colorado

PROJECT INVESTIGATIONS

The potential Blue-South Platte project is located in north central Colorado in the Colorado and South Platte River watersheds. Project water resources located west of the Continental Divide would be derived from about 800 square miles of the upper Colorado River watershed in Pitkin, Eagle, Summit, and Grand Counties. The water utilization area would be located east of the Continental Divide in the upper South Platte River Basin and would include the city and county of Denver and about 1,550 square miles of agricultural lands in Adams, Arapahoe, Boulder, Jefferson, Weld, Douglas, and Morgan Counties.

This potential multiple-purpose project would divert 430,000 acre-feet of water from the headwaters of the Colorado River to the South Platte River Basin for irrigation, municipal, and power purposes. The project would provide supplemental irrigation water for 264,000 acres of land now suffering severe late-season water shortages, would provide a full water supply for 83,000 acres of land now dry-farmed, and would recharge underground aquifers and thus provide a full water supply for an additional 29,000 acres of land irrigated by pumping systems. The project would also supply 50,000 acre-feet annually to the Denver metropolitan area where additional water will be needed to permit an eventual population increase to 1,000,000 persons. Eight power plants with an installed capacity of 265,800 kilowatts would utilize 3,200 feet of power head to produce about

1 billion kilowatt-hours of marketable power annually. Additional benefits would accrue to the area through utilization of project reservoirs for fish and wildlife preservation and for recreational purposes.

Cliffs-Divide Project, Colorado

PROJECT INVESTIGATIONS

The Cliffs-Divide project area comprises the basin of the Colorado River above its confluence with the Gunnison River at Grand Junction, Colo. The total area of this part of the Colorado River Basin is 8,800 square miles. The basin extends from the Little Book Cliffs on the west to the Continental Divide on the east, a distance of approximately 170 miles. Principal municipalities in the basin are Rifle, Glenwood Springs, Aspen, Eagle, and Hot Sulphur Springs.

Purpose of the investigation is to develop plans for utilizing the water resources within the basin. In addition to advancing the investigations within the basin the information is required for completion of the now well advanced Blue-South Platte and Gunnison-Arkansas project investigations being made by region 7.

The mean annual runoff in the Colorado River above Grand Junction has been some 3,700,000 acre-feet. Land areas that could be served new or supplemental water within the basin total in the neighborhood of 237,000 acres. The vast oil shale deposits within the basin present a potential heavy local demand upon water resources. Domestic and industrial water needs and potential hydroelectric power developments are to be considered.

Cliffs-Divide Project, Colorado

RECONNAISSANCE

The Cliffs-Divide project area comprises the basin of the Colorado River above its confluence with the Gunnison River at Grand Junction, Colo. The total area of this part of the Colorado River Basin is 8,800 square miles. The basin extends from the Little Book Cliffs on the west to the Continental Divide on the east, a distance of approximately 170 miles. Principal municipalities in the basin are Rifle, Glenwood Springs, Aspen, Eagle, and Hot Sulphur Springs.

The investigation will include a new inventory of irrigable lands which will entail a reclassification survey consisting of a review of the areas previously classified and classification of presently irrigated and potentially irrigable land previously unclassified. It will also include the formulation of feasible plans to serve the arable lands with irrigation water and a determination of the relative justification of investigating the possibilities in detail. The investigation will inventory all water resources and potential water requirements for irrigation, industrial and domestic uses, and outline plans of facilities necessary to satisfy these requirements within the limits of the water resources. Potential hydroelectrical development will also be outlined.

The final report on this project will provide a basis for future negotiations on potential transmountain diversions from the upper Colorado River Basin. It will also serve as a guide toward the efficient and orderly development of the Colorado River Basin by outlining the more urgent needs in the area involved in the Cliffs-Divide project.

Collbran Project, Colorado

PROJECT INVESTIGATIONS

The area to be irrigated by the project is located in Mesa County, west central Colorado, in the basin of Plateau Creek, a tributary of the upper Colorado River. Principal towns in the area are Collbran, Molina, and Mesa. The area to receive municipal water supplies is centered around the city of Grand Junction at the junction of the Gunnison and Colorado Rivers.

The purpose of this project is to provide water for the irrigation of arable land in Plateau Valley and to provide urgently needed domestic water for the city of Grand Junction and all the surrounding towns in Grand Valley. Power would be generated by utilization of the excess head in the municipal water delivery pipe line.

Major features in the plan of development include Vega Reservoir, capacity 30,000 acre-feet; Bonham Reservoir, capacity 6,300 acre-feet; the south side canal, a 26-mile main pipline for delivery of municipal water, and two power plants at drops along the pipeline. The project would provide a supplemental irrigation

supply for 18,340 acres, a full irrigation supply for 2,310 acres, an installed power generation capacity of 7,400 kilowatts, and an ultimate municipal water supply for Grand Junction and vicinity of 10,300 acre-feet annually.

Colorado River Storage Project, Colorado, New Mexico, Utah, and Wyoming

PROJECT INVESTIGATIONS

The project area includes upper Colorado River Basin lands and adjacent lands in the States of Colorado, New Mexico, Utah, and Wyoming. To permit these States to beneficially consume their share of Colorado River water as apportioned by the 1922 Santa Fe compact and fulfill their obligations for downstream delivery as further specified therein, reservoir storage must be provided for holdover of surplus flows during periods of high runoff to supplement reduced river flows at Lee Ferry in low runoff periods.

The purpose of this investigation is to determine a system of reservoirs that will yield the maximum water supply for irrigation by confining reservoir storage losses to an economic minimum, and simultaneously accomplish all other possible purposes of multiple-purpose operation, including river regulation, power development, recreation, fish and wildlife conservation, and sediment retention.

Colorado River Storage Project, Austin Unit, Colorado

PROJECT INVESTIGATIONS

This unit includes a dam at the Austin site on the Gunnison River about 5 miles upstream from the North Fork confluence, a reservoir and a power plant located downstream, with releases conveyed from the reservoir through a 3-mile tunnel to take advantage of a total of 380 feet of available power drop. In addition, the possibility of supplying replacement irrigation water to lands in the lower Uncompahgre Valley is being considered as a means of increasing the flow through the Lower Crystal plant by reducing upstream diversions through the existing Gunnison Tunnel to the Uncompahgre land.

Colorado River Storage Project, Cross Mountain Unit, Colorado

PROJECT INVESTIGATIONS

The Cross Mountain dam site is located on the Yampa River in a narrow canyon section about 8 river miles upstream from the Little Snake River. The reservoir site is particularly valuable as a unit of the Colorado River storage project because of its large capacity and relatively low evaporation rate. Other desirable features include possible utilization of 200 feet of additional power head by means of a 2-mile power tunnel from the dam to a plant at the mouth of Cross Mountain Canyon, and the salvage of downstream channel losses due to reduction of flood flows. The further possibility of diverting unused flows of the White River into the Yampa River above the Cross Mountain site would enhance the power potential of this unit.

Colorado River Storage Project, Crystal Unit, Colorado

PROJECT INVESTIGATIONS

The Crystal damsite is located on the Gunnison River about 6 miles downstream from the town of Cimarron in west central Colorado. With upstream regulation at the potential Curecanti Reservoir, nearly 300 feet of power head could be developed by means of a dam at this site. Several alternative possibilities exist for development of this available power head. The physical limit on storage at this site makes it dependent upon regulatory storage upstream.

Colorado River Storage Project, Curecanti Unit, Colorado

PROJECT INVESTIGATIONS

Construction of a dam at the Blue Mesa site located about 1 mile downstream from the mouth of Lake Fork on the Gunnison River would impound in Curecanti Reservoir the surplus waters of the upper Gunnison Basin. Past investigations have indicated this to be the largest feasible regulatory reservoir site on the upper

Gunnison River. It has advantages of low evaporation rates, storage capacity for regulation of streamflow for potential down-stream power plants, utilization of over 450 feet of power head, and downstream channel salvage due to reduction of peak flood flows.

Colorado River Storage Project, Echo Park Unit, Colorado-Utah

PROJECT INVESTIGATIONS

This is the key storage unit on the Green River for the Upper Basin storage system. Located in Colorado just 3 miles downstream from the Yampa River confluence, a high dam at this site has excellent storage and power possibilities. In addition to its strategic location for regulating the flows of these two major streams, this site enjoys advantages attendant to upstream location, such as low evaporation loss, regulation for downstream power plants, and channel water loss salvage resulting from reductions in flood flow.

Dolores Project, Colorado and Utah

PROJECT INVESTIGATIONS

The project area is located in Dolores and Montezuma Counties, in southwester Colorado and in San Juan County, Utah. It is in the basin of the Dolores River, a tributary of the Upper Colorado River.

The purpose of this investigation is to determine the possibilities for a storage water supply to irrigate some 40,000 acres of arable land in the Dove Creek area of southwestern Colorado. The plan contemplates construction of a storage dam at the McPhee site on the Dolores River about 10 miles below Dolores, Colorado.

Florida Project, Colorado

PROJECT INVESTIGATIONS

Along the Florida River Valley and on adjacent mesas in the vicinity of Durango, southwestern Colorado, are 6,300 acres of raw land suitable for irrigation and 12,600 acres of irrigated land in need of a supplemental late season water supply. Additional water for nearly full irrigation of these lands could be provided by construction of a storage dam and reservoir on Florida River and enlargement and extension of existing canals. The purpose of the investigation is to formulate the most feasible plan of development and to determine the desirability of its undertaking as a Federal Reclamation project.

Fruitgrowers Dam Project Extension, Colorado

PROJECT INVESTIGATIONS

The area involved in this investigation is located in Delta County, west central Colorado, south of the town of Cedaredge. The lands are along the lower stream valleys of Tongue Creek and its tributaries, extending south to the Gunnison River. The potential development would directly affect the water supply of 3,500 acres most of which are presently inadequately irrigated and indirectly by exchanges of water it would increase the water supply for part of an additional 15,000 acres.

This unit would include the enlargement of the existing Fruitgrowers Dam and Reservoir and the construction of a pumping plant, a reservoir feeder canal and a distribution canal. The purpose of the investigation is to formulate the most feasible plan of development and to determine the desirability of its undertaking as a Federal reclamation project.

General Power Studies, Colorado, Kansas, New Mexico, Oklahoma, and Texas

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program to provide maximum utilization of power resources. The studies include consideration and study of firming power sources such as coal-fired gas turbines; system planning through use of network analyzers; studies of transmission interconnections with other regions and utility systems; considera-

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tion of regional transmission requirements; coordination of plants and systems; and preparation and interchange of technical data incidental to the plans of the Federal Power Commission, other Federal agencies, and State agencies. Annual revision of the region 5 power program as set forth in the Bureau's advance power program to reflect latest plans is also included.

Grand Valley Project, Orchard Mesa Division, Colorado

INVESTIGATION OF EXISTING PROJECTS

The Orchard Mesa division of the Grand Valley project is located on the south side of the Colorado River in the vicinity of the towns of Palisade and Grand Junction, Colo.

Operation and maintenance is performed by the Orchard Mesa irrigation district. The District contracted to repay $1,001,340 of which accruals in the amount of $404,600 have been paid in full.

The original Orchard Mesa facilities were constructed by private interests beginning in 1907 and water was first delivered in 1910. Between 1917 and 1926 the Bureau of Reclamation constructed a siphon under the Colorado River to supply water from the Garfield gravity division canal, replaced the pumping facilities with four vertical direct-connected turbines and pumps, the distribution canals were practically rebuilt and some drainage channels were dug.

The original pump house and penstocks (installed in 1909), are still in use. The penstocks are in need of replacement and additional water is required for the 8,600 acres now irrigated.

Gunnison-Arkansas Project, Initial Development (Roaring Fork Diversion), Colorado

PROJECT INVESTIGATIONS

The project area is located along the upper Arkansas River Basin above Pueblo and includes about 26,150 square miles. Also included is the western slope diversion area at the headwaters of the Fryingpan River of the upper Colorado River Basin.

The purpose of this investigation is to ascertain the feasibility of transbasin diversion of water from the Colorado River Basin to the Arkansas River Basin. Two cumulative plans for transbasin diversions are being studied for feasibility: An initial development and a maximum gravity diversion. The initial development would include a diversion of 69,200 acre-feet from the Fryingpan River and would provide a partial supplemental irrigation supply to about 322,000 acres of inadequately irrigated land in the Arkansas Valley in Colorado; provide for 104,800 kilowatt power installation; including additional municipal water to Pueblo, Colorado Springs, and other valley towns and large blocks of hydroelectric power for industrial use and expansion.

Gunnison River Project, Colorado

PROJECT INVESTIGATIONS

The Gunnison River project embraces the entire drainage basin of the Gunnison River, a tributary of the upper Colorado River. The basin has an area of 8,020 square miles and extends over seven Colorado counties from the Continental Divide to a western termination at Grand Junction. Principal municipalities in the basin are Gunnison, Montrose, Delta, Paonia, Cedaredge, Crested Butte, Ouray, and Lake City.

Purpose of the investigation is to develop the water resources of the basin to the extent permitted by Colorado's allotment of Colorado River water. In addition, the information is required for completion of the now well advanced Gunnison-Arkansas project investigations being made by region 7.

The status report on the reconnaissance investigations conducted in 1950 and prior years outlines a total of 17 irrigation projects and indicates the power potential and water needs of the basin. The Paonia project is now under construction and investigations of the Smith Fork and Cedaredge units of the Gunnison River project are nearing completion. The various potential units outlined in the report would serve 94,000 acres of virgin land and provide for optimum crop production on 100,000 acres of irrigated land now suffering water shortages.

Gunnison River Project, Colorado

RECONNAISSANCE

The Gunnison River project embraces the entire drainage basin of the Gunnison River, a tributary of the upper Colorado River. The basin has an area of 8,020 square miles and extends over seven Colorado counties from the Continental Divide to a western termination at Grand Junction. Principal municipalities in the basin are Gunnison, Montrose, Delta, Paonia, Cedaredge, Crested Butte, Ouray, and Lake City.

Purpose of the investigation is to appraise the water resources and extent to which they might feasibly be utilized within the Gunnison River Basin for irrigation, power, new industry, and other uses. Reclamation development within the basin must be correlated with plans for a proposed diversion of water from the Gunnison River to the Arkansas River Basin and with other potentialities for utilizing Colorado's allotted share of Colorado River Basin water.

The Gunnison River Basin has a mean annual runoff of 1,980,000 acre-feet. Irrigated lands total 233,670 acres and 216,070 acres of potentially productive land are not now irrigated. Grazing-land timber resources, mineral resources, and recreation attractions are important considerations in the future development of the basin. Water resources and natural topography are favorable for the development of electric energy. Flood control and river regulation are secondary benefits that can result from the full utilization of the basin resources.

Nucla Project, Colorado

PROJECT INVESTIGATIONS

The project area is located in Montrose County, western Colorado, in the basin of the Dolores River, a tributary of the upper Colorado River.

The purpose of the investigation is to determine the possibilities for a distribution system taking water from the San Miguel River and Cottonwood Creek to serve supplemental water to 5,800 acres of dry land, all near Nucla, Colo. Required storage water could be developed in San Miguel River, Cottonwood Creek, or Horsefly Creek.

Paradox Project, Colorado

PROJECT INVESTIGATIONS

The project area is located in Montrose County, southwestern Colorado, in the basin of the Dolores River, a tributary of the upper Colorado River.

The purpose of the investigation is to determine the possibilities for a storage water supply to supplement the present inadequate water supply for 3,900 acres of presently irrigated land and a full supply to 5,500 acres of arable dry land. Storage would be obtained by enlargement of the existing Buckeye Reservoir on West Paradox Creek.

Pine River Project Extension, Colorado and New Mexico

PROJECT INVESTIGATIONS

The project area is located in La Plata and Archuleta Counties, southwestern Colorado, San Juan County, northwestern New Mexico, and is in the basin of the San Juan River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities for using the surplus flow of Pine River and its tributaries, supplemented by storage from the existing Vallecito Reservoir, to irrigate 15,100 acres of new land. This new land is in the vicinity of Ignacio, Bayfield and Arboles, Colo.

San Juan-Chama Project, Colorado and New Mexico

PROJECT INVESTIGATIONS

The area involved in the San Juan-Chama project includes the upper reaches of the San Juan River in southwestern Colorado, and the entire watershed of the Rio Grande in New Mexico. In addition, small areas of the Canadian and Pecos Rivers watersheds become involved because of other potential small transbasin diversions.

The Rio Grande Valley is the region in which the first settlement by European immigrants in the United States occurred. Over a long period of time, the increase of population at a rate faster than the increase in means of subsistence has resulted in an acute need for expanding the land base. The pressure of population on the land resources probably is not exceeded anywhere else in the Nation.

The plan to be investigated would transfer the divertible waters of the San Juan River into the Rio Grande Basin where they would be used for the multiple purposes of power generation, fish and wildlife propagation, recreation development and for application to new lands or as a supplemental water supply to lands now irrigated. The plan might include provision for supplying the municipal requirements of national defense establishments and urban communities in the area.

The purpose of the investigations is to determine, first, the relative advantages to New Mexico of the potential uses of the available water in the San Juan Basin and the Rio Grande Basin. From this information, a decision will be made on the amount of water to be diverted to the Rio Grande. The most feasible of the potential uses in the Rio Grande will then be selected for the plan of development on the basis of all factors involved. During fiscal years 1951 and 1952, the investigations would be directed toward:

(1) Inventory of potential water uses in the Rio Grande watershed.

(2) Program report on the portion of the project lying upstream from the mouth of the Rio Chama.

(3) Program report on the water-use portion of the project lying downstream from the mouth of the Rio Chama.

San Miguel Project, Colorado

PROJECT INVESTIGATIONS

The project area is located in Montrose and San Miguel Counties, southwestern Colorado, in the basin of the Dolores River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities of developing a water supply through storage regulation of the San Miguel River and its tributaries to furnish a supplemental irrigation water supply for lands now irrigated and a full supply for about 41,000 acres of new land.

Saucer Valley Project, Colorado

PROJECT INVESTIGATIONS

The project area is located in San Miguel County, southwestern Colorado, in the basin of the Dolores River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities of developing a storage water supply to furnish 1,300 acres of irrigated land with supplemental water to supply irrigation water for 5,000 acres of new land adjacent to Disappointment Creek. Storage would be obtained at the Custer site on Spring Creek with the reservoir supplied water by a diversion canal extending from Disappointment Creek.

Silt Project, Colorado

PROJECT INVESTIGATIONS

The potential Silt project is located adjacent to Rifle Creek, a tributary of Colorado River, in west-central Colorado. It would require reservoir storage regulation on Rifle Creek to supply irrigation water for 1,800 acres of arable dry land and 5,000 acres now partially irrigated near the towns of Silt and Rifle. Rehabilitation and extension of existing canals would also be required.

The purpose of the investigation is to formulate a feasible plan for the project and appraise its desirability for undertaking as a Federal reclamation project.

Smith Fork Project, Colorado

PROJECT INVESTIGATIONS

The area involved in this investigation is located in Delta County, west-central Colorado, on the Smith Fork of the Gunnison River and Cottonwood Creek, a tributary of the North Fork of the Gunnison River. The town of Crawford is the only community in the project area.

The construction of a reservoir on Smith Fork at the Crawford site to a capacity of 14,000 acre-feet and of a feeder canal to the reservoir, and the enlargement and extension of the existing Aspen Canal would make possible the irrigation of 2,130 acres of new land and provide supplemental water to 7,670 acres of land presently irrigated. The purpose of the investigation is to formulate the most attractive plan of development and to determine the desirability of its undertaking as a Federal reclamation project.

Uncompahgre Project, Colorado—Investigations of Existing Projects

REHABILITATION AND BETTERMENT

The Uncompahgre project area is located in western Colorado in the counties of Montrose and Delta in the basin of the Uncompahgre River, a tributary of the Gunnison River. Taylor Park Reservoir on the Taylor River is located in Gunnison County.

The project, comprising 71,000 acres of irrigable land obtains its water supply from the Gunnison and Uncompahgre Rivers. Storage for the project is provided at Taylor Park Reservoir on the Taylor River, a tributary to the Gunnison River. Direct flow and stored water is diverted from the Gunnison River through the 6-mile long Gunnison tunnel to the Uncompahgre Valley where it is used to supplement direct flows from the Uncompahgre River. The project has been in continuous operation since the first project water was available in 1908. Lands are served by 568 miles of canals and laterals and 205 miles of open drains. Natural deterioration and inability of the association to obtain needed supplies, materials, and labor during World War II have resulted in a need for extensive rehabilitation on certain major structures, the cost of which would be beyond the ability of the water users to finance from available sources. Under terms of the contract of December 7, 1948, the water users are obligated to repay to the Government about $5,958,000 at an annual rate of $60,000. The project works are maintained and operated by the Uncompahgre Valley Water Users' Association.

The purpose of this investigation is to determine the need, extent, and estimated cost of rehabilitation and betterment work to place the project facilities in good operating condition and thereby prevent their sudden failure with resulting losses.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

Yampa River Project, Little Snake Division, Savery-Pot Hook Unit, Wyoming-Colorado

PROJECT INVESTIGATIONS

The area involved in this investigation is located along the Colorado-Wyoming border within the basin of the Little Snake River, a tributary of Yampa River. The land areas to be served are located along the valley of Little Snake River and adjacent mesas between Slater, Colo., and a point south of Baggs, Wyo.

Purpose of the investigation is to determine the possibilities of developing storage water on Savery Creek and at the Pot Hook site on Slater Creek to serve lands now inadequately irrigated and for the irrigation of new lands.

Major features would include reservoirs at the Savery and Pot Hook sites, a feeder canal from Little Snake River, two distribution canals, and the extension and enlargement of an existing canal. The project would provide a full supply for around 45,000 acres of new and inadequately irrigated land.

IDAHO

Agricultural Surpluses and Land Development, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Since the end of World War II, the general question of agricultural surpluses has been given increasing attention. Some indivuduals have criticized the Reclamation program on the ground that it merely contributes to those surpluses. The purpose of this investigation is to make a careful appraisal of both the short- and long-run effects of land development upon agricultural surpluses. The study will cover both the theoretical and historical aspects of the problem. It will include consideration of all land development in the Nation with special emphasis upon irrigation in the Western States. It will also include a consideration of the dynamics of land development and the related effect upon population, income, and demand for agricultural products.

Bear River Project, Utah and Idaho

PROJECT INVESTIGATIONS

The project area is located in Franklin and Oneida Counties, Idaho, and Cache and Box Elder Counties, Utah, in the Bear River Basin. Land areas to be served are centered near Preston, Idaho; Richmond, Utah; Plymouth, Utah; Samaria, Idaho; Tremonton and Snowville, Utah.

The investigation of the Bear River project has as its object the development of a plan for the fullest practicable control and use of the Bear River water for multipurposes including irrigation, power, flood control, recreation, and fish and wildlife propagation. Although Bear River at present is extensively developed for irrigation, power, and other uses, greater and more efficient use of its water could be accomplished through additional storage control and by altering or decreasing downstream uses of water for power.

The project is comprised of two principal divisions; namely, the Cache division involving approximately 12,000 acres of new land and 48,000 acres of land inadequately irrigated, and the Oneida division with approximately 112,000 acres of new land and 42,000 acres of land inadequately irrigated. The total land acreage under the project is 124,000 acres of new land and 90,000 acres requiring a supplemental supply.

Big Lost River Project, Idaho, Mackay Division

PROJECT INVESTIGATIONS

The purpose of this investigation is to provide information to the water users of Big Lost River Valley on seepage losses through Mackay Dam and to determine the most feasible method of preventing leakage. The information will be provided without a full scale investigation if possible and with a minimum expenditure of funds. This study is being conducted in cooperation with the Idaho State Reclamation Engineer.

Big Wood River Project, Idaho

PROJECT INVESTIGATIONS

The purpose of this investigation is to furnish a full supply of irrigation water to about 20,000 acres of land. The project area lies along the Big Wood River in Blaine County, Idaho, north and south of the town of Bellevue. Water would be obtained by storage on Warm Springs Creek, a tributary of the Big Wood River.

Birch Creek Project, Idaho

PROJECT INVESTIGATIONS

This project is located on the north side of the Snake River plain in the mountain valleys along Birch Creek. This stream rises between the Beaverhead and Lemhi Mountains and sinks into the lava beds at the north edge of the plain about 16 miles west of Mud Lake. The potential project area comprises about 3,700 acres of irrigated land in need of supplemental water and about 4,500 acres of new land and is located in Clark and Butte Counties, Idaho.

The purpose of this investigation is to determine the practicability of supplying the needed supplemental water, to investigate the use of surplus water for development of new land and to make such detailed studies as necessary to prepare a report on the possible development as a whole or any part as may appear justified under present economic relationships.

Boise Project, Arrowrock Division, Idaho

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to readjust the repayment contracts of irrigation districts comprising the Boise project in Idaho. Present so-called 5-percent contracts are not sensitive to annual economic fluctuations affecting repayment ability of water users. They have been advantageous to water users in the wartime period of rising prices, but are disadvantageous in a period of declining prices. Demand for adjustment has become acute with the first evidence of lower agricultural prices. Because a substantial portion of the project works have been constructed in the wartime and postwar era of high construction costs, it will be necessary to consider a reallocation of costs and to appraise the possible nonreimbursable benefits of the project attributable to recreation, fish and wildlife, and flood control.

Boise Project, Payette Division, Idaho

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to analyze factors contributing to the project's ability to repay its obligation to the United States, with emphasis on possible alternatives for application of revenues from power produced at Black Canyon Dam for repayment of project costs. Power studies will include pay-out studies for use in negotiating an amendatory repayment of contract with the Black Canyon irrigation district.

Boise Project, Payette Division, Idaho

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to determine the type and extent of rehabilitation work necessary to properly recondition Black Canyon Dam. This dam, located on the Payette River approximately 7 miles upstream from Emmett, Idaho, was constructed 25 years ago, and some rehabilitation work is now deemed necessary. It is anticipated that rehabilitation and betterment funds will be available as soon as a determination is made as to the type and cost of repairs needed, and a satisfactory method of repayment has been arranged with water users.

Boise Project, Payette Division, Payette Heights Unit, Idaho

PROJECT INVESTIGATIONS

The purpose of this investigation is to determine a means of furnishing a full water supply to approximately 1,100 acres of presently dry land. The project is located near the city of Payette in Payette County in southern Idaho.

Bruneau Project, Idaho

PROJECT INVESTIGATIONS

The Bruneau project contains approximately 700,000 acres of land of which 400,000 acres are potentially irrigable. The soils and general physical features

make this area generally suitable for irrigation. Since it is largely dry desert land it will offer numerous opportunities for settlement and create many additional opportunities for employment.

The Bruneau project lies largely in northern Owyhee County, Idaho.

Bruneau River Project, Idaho

PROJECT INVESTIGATIONS

Unregulated flows of the Bruneau River now provide a water supply for about 21,000 acres. The irrigated lands consist largely of small tracts scattered along the stream. These small tracts are used as stock ranch headquarters. The potential Bruneau River project would consist of an additional 80,000 acres of land lying west of the Bruneau River and above the lands of the Bruneau project which will be served from the Snake River. To supply the Bruneau River project, storage of 350,000 acre-feet of Bruneau River water will be needed. The Bruneau River project lies in Owyhee County in southwestern Idaho.

Cache Division, Bear River Project, Utah and Idaho

PROJECT INVESTIGATIONS

The project area is located in Franklin County, Idaho, and Cache County, Utah, in the Bear River Basin. Land areas to be served are centered near Preston, Idaho, and Richmond, Utah.

Purpose of the project is to improve the water supply for terrace lands lying east of Bear River. Storage will be obtained on tributary streams of Bear River by construction of Mapleton Reservoir and enlargement of the existing Glendale Reservoir. The project would provide water for the supplemental irrigation of 48,000 acres of land now inadequately irrigated and development of 12,000 acres of new land.

Camas Creek Project, Idaho

PROJECT INVESTIGATIONS

Studies are needed to determine whether adequate storage of water to provide late season irrigation water for about 5,000 acres, irrigated from natural flows of Camas Creek above Mud Lake, can be developed. There are no storage reservoirs on Camas Creek at present. The Camas Creek project lies in Clark and Jefferson Counties in northeastern Idaho.

Clark Fork Basin, Mont., Idaho, and Wash.

BASIN SURVEYS

The purpose of this investigation is to prepare a basin-wide report outlining ultimate plans of development in the Clark Fork Basin, and to present individual projects for authorization and further investigation. The basin lies in western Montana, northern Idaho, and eastern Washington.

The area of the basin upstream from Lake Pend Oreille of northern Idaho is assigned to the Bureau of Reclamation for investigation and development of multiple-purpose projects under the Bureau-Corps of Engineers' agreement of April 11, 1949, on the Columbia River Basin. Development of irrigation projects throughout the basin, moreover, remains a Bureau function. One of the purposes of the investigation will be to fit the plans for reservoirs in the area made by the Corps of Engineers into the over-all plan for development of the basin.

Columbia River Basin, Wash., Oreg., Idaho, Mont., Wyo., Utah, and Nev.

BASIN SURVEYS

The Columbia River drains a watershed of 259,000 square miles in the Pacific Northwest. It has been called the heart-land of the Northwest. A plan for comprehensive development of the basin's water resources has been prepared by the Bureau of Reclamation for the Department of the Interior. A second similar plan has been prepared by the Corps of Engineers of the Department of the Army. These two plans have been coordinated by agreement between the two departments (Interior's report is H. Doc. 473, 81st Cong.).

The Bureau of Reclamation has a number of responsibilities for continuing investigations related to the plan for comprehensive development of the Columbia

River Basin. These responsibilities stem from recommendations in the departmental report, from the agreement between the Interior and Army Departments, and from actions of interagency committees in the Pacific Northwest who are concerned, in part, with development of the Columbia River Basin.

Excess Land Survey, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation, which is region-wide, is to gather and analyze all data relating to compliance with the acreage limitations of reclamation law and to bring all violations into compliance with the law and with the irrigation districts' contracts with the United States. A periodical inventory of this nature is necessary because of the constantly changing pattern of landholdings.

General Power Studies, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program which would enable maximum economic development and utilization of power and water resources of the area. Full development of the region's power plan will require technical studies for (1) the planning of a program for development of power resources and power systems or parts thereof, (2) the marketing and sale of power, and (3) the establishment of rate schedules.

These power studies involve power plant, system, and intersystem planning, as well as power site and capacity determinations, transmission requirements, coordination of plants and systems, technical studies for the development of power resources, the marketing and sale of power, the establishment of rate schedules, average rate and repayment studies covering existing and proposed projects and estimated financial operation until complete return of costs borne by power are effected, and preparation and interchange of technical data incidental to the plans of other agencies. Such agencies include Corps of Engineers, Bonneville Power Administration, public and privately owned utilities, State power administrations, Federal Power Commission, and other State and Federal agencies.

Hells Canyon Project, Idaho and Oregon

PROJECT INVESTIGATIONS

This project is located on the Snake River on the Idaho-Oregon State line, 108 miles upstream from Lewiston, Idaho, and 94 miles downstream from Weiser, Idaho.

The general plan provides for the construction of a high dam in the canyon section of the Snake River between the Blue Mountains of Oregon and the Seven Devil Mountains of Idaho. The project consists of a reservoir which would impound 4,400,000 acre-feet of water and a power plant of 900,000 kilowatt capacity. There would be resultant benefits to flood control, navigation, and recreation, in addition to power benefits.

The purpose of the current investigation of access roads is to supplement the data previously obtained and furnish a sound base for future studies that will be required in connection with preparation of a definite plan report on this project.

Jordan Valley Project, Idaho

PROJECT INVESTIGATIONS

The purpose of the survey is to develop a plan of supplying supplemental water to approximately 9,000 acres of inadequately watered farm land. The areas to be served lies along Jordan Creek in the State of Oregon, Malheur County, and the reservoir site lies in the State of Idaho, Owyhee County.

Michaud Flats Project, Idaho

PROJECT INVESTIGATIONS

This project is located south of Snake River adjacent to American Falls Reservoir near the city of American Falls in Power County in southeastern Idaho.

The purpose of this investigation is to select the lands to be irrigated and to prepare preliminary plans for irrigation facilities to utilize the storage water allo-

cated to this area from American Falls and Palisades Reservoirs. The part of this area outside the Fort Hall Indian Reservation is now being dry-farmed in a wheat and fallow rotation.

Middle Clark Fork Project, Idaho and Montana

PROJECT INVESTIGATIONS

The project is located on Clark Fork River in Bonner County, Idaho, and Sanders County, Mont.

Purpose of the project is to develop power for irrigation pumping and commercial use at the Cabinet Gorge, Noxon Rapids, and Trout Creek run-of-river power sites, totaling some 657,000 kilowatts of potential power installation.

Minidoka Project, Idaho

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to adjust existing repayment contracts with irrigation districts of the Minidoka project. These readjustments will clarify the water users' total financial obligation to the United States and will equitably reallocate the obligations between the so-called old and new lands.

Minidoka Project, North Side Pumping Division, Idaho

ADVANCE PLANNING

The North Side pumping division, located near Rupert, Idaho, consists of 77,650 acres of potentially irrigable public withdrawn land, of which 64,000 acres are to be irrigated by pumping from ground water and 13,650 acres are to be irrigated by pumping from the Snake River. A portion of the presently reserved space in American Falls Reservoir, augmented by storage from the proposed Palisades project, will be used to supply the 13,650 acres.

The Division was authorized for construction in Public Law 864, Eighty-first Congress, as approved September 30, 1950. Although the general plan of construction has been well established, the adequacy of water supply for the 64,000 acres which are to be served from wells can only be determined by actually drilling the wells and testing them by pumping throughout successive irrigation seasons in order to observe the total effect of the pumping on the underground water table. $1,000,000 of Minidoka project construction funds, originally appropriated for the Gooding division, have by limitations in successive appropriation Acts of the Congress, been made available to continue the investigative program of the North Side pumping division. Since 1947, such funds have been applied almost entirely to a program of proving the underground supply at selected test sites.

Mountain Home Project, Idaho, Payette Division

PROJECT INVESTIGATIONS

The purpose of the Mountain Home project is to provide irrigation to about 380,000 acres of presently dry land. The Payette Division would be the first step in the development of the total project and would provide irrigation to 192,000 acres. The project presents a special problem in obtaining a water supply that can be delivered to the lands in an economical manner. Although the Snake River is immediately adjacent to the project, the lands lie from 600 to 1,000 feet above the level of the river. A tentative plan has been developed which involves the storing of surplus waters of the Payette River Basin in Cascade and Garden Valley Reservoirs and transporting it into the Boise River Basin via a long tunnel for use on the irrigated lands of the Boise project. In exchange for the Payette River water delivered to the Boise project canals, an equivalent amount would be diverted from the Boise River further upstream for use on the Payette Division of the Mountain Home project. A substantial block of hydroelectric power will be developed on the waterways of the transbasin diversion. This will help to relieve an imminent power shortage in southern Idaho. The Payette Division of the Mountain Home project is located in southwestern Idaho on the Snake River Plain north of the Snake River between Gleens Ferry and the irrigated Boise Valley.

Oneida Division, Bear River Project, Utah and Idaho

PROJECT INVESTIGATIONS

The potential Oneida division is located in Franklin and Oneida Counties, Idaho, and Cache and Box Elder Counties, Utah, in the basin of the Bear River. Land areas to be served are centered near Preston, Idaho; Samaria, Idaho; Plymouth, Tremonton, and Snowville, Utah.

Purpose of the investigation is the development of a plan for greater utilization of Bear River water for irrigation, power, flood control, recreation, and fish and wildlife protection. By means of the reservoir development at Bear Lake, waters of Bear River originating above Bear Lake are completely regulated for irrigation and power production. Additional storage facilities are needed, however, below Bear Lake to provide an enlarged supply for supplemental irrigation and to develop new land for irrigation.

The plan involves new storage development at the Thatcher site on Bear River, at the offstream Sage Valley and by the enlargement of the existing Cutler Reservoir on Bear River. The project would serve approximately 112,000 acres of new land and 42,000 acres of land inadequately irrigated. An installed capacity of 750 kilowatts would be used for power production at the Sage Valley Reservoir site.

Operation and Maintenance Cost and Replacement Analysis, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation is:

1. To obtain a functional breakdown of costs of operating and maintaining irrigation systems.
2. To obtain a functional breakdown of cost of replacement items.
3. To evaluate the extent to which, and under what conditions certain physical and organizational factors influence these costs.
4. To provide a basis for setting up a uniform accounting system which will provide more useful information from operating projects, and develop basic information for forecasting operation and maintenance costs under a wide variety of circumstances.

Detailed data on operation, maintenance, and replacement costs are urgently needed to permit more accurate estimates to be made for projects in the planning phase. Also, operating projects urgently need some criteria which can be used to compare current operation and maintenance and replacement costs; a study of the nature outlined herein would enable criteria to be set up based upon firm experience data.

Owyhee Project, Oregon and Idaho

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to provide factual data and analyses prerequisite to development of a fair and equitable plan of repayment for the eight irrigation districts comprising the Owyhee project. The present contracts with these districts would require annual construction payments, beginning in 1950, considerably in excess of the water users ability to pay. Furthermore, the contracts do not provide for varying the annual charges in accordance with variations in crop income and with ability to pay.

Rathdrum Prairie Project, Idaho

PROJECT INVESTIGATIONS

The Rathdrum Prairie project would involve development of water supplies for 31,000 acres of new land and supplemental water supplies for about 3,500 acres. The lack of a readily developed water supply, or of power generation capacity to permit the exchange of power for water now utilized by existing power plants on the Spokane River, has made questionable the plans for development of the project which contemplated pumping from that river. Therefore, a reexamination of the original proposal to pump from Pend Oreille Lake will be made.

Snake River Basin, Idaho and Oregon

BASIN SURVEYS

The area to be studied under this investigation is defined as the Snake River drainage basin from the mouth of the Salmon River upstream to Milner Dam, excluding the Powder River drainage area in Oregon. The area will also include all the drainage area lying south of the Salmon River which drains into that stream.

The purpose of this investigation is to study the area as a whole to determine the best use of the available water supply. The area will be studied on a selective basis, choosing the best lands for study and development and with the available water supply in mind. Those areas that are found to require more study will later be set up as separate projects and a detailed study made as to engineering and economic feasibility.

Sprinkler Irrigation, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Purpose of this investigation is to assemble basic information relating to sprinkler irrigation. Studies will include analysis of the effect on yield, the associated costs related to various land types and crops, and water requirements when application is by sprinkler. The study will be carried out within the region. Such information is necessary for the proper selection of irrigation systems and the determination of feasibility of potential projects. The data obtained from this study will aid not only in the project planning phase, but will be usable on existing projects when the water users consider conversion to sprinkler application.

Teton Basin Project, Idaho and Wyoming

PROJECT INVESTIGATION

This project is located in Teton Basin, Teton County, Idaho, and Teton County, Wyo. The town of Driggs, Idaho, which is the county seat of Teton County, Idaho, is situated approximately in the center of the project.

Supplemental water is needed for the presently irrigated lands of the project and there are large areas of dry lands believed to be suitable for irrigation if a water supply can be developed. Therefore, the purposes of this investigation are (1) to inventory and evaluate the potential irrigation development opportunity in Teton Basin, (2) to advance a plan of reclamation development concordant with the potentialities of the area, (3) to make such detailed studies as necessary to prepare a possibility report on the development as a whole or such part as may appear justified under present economic relationships.

Interstate division of the water supply has been referred to the Snake River Compact Commission of Idaho and Wyoming and information on irrigated areas will also be obtained for this commission.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

KANSAS

Arkansas-White-Red River Basins (Upper Arkansas River Basin, Colo. and Kans.)

BASIN SURVEYS

In accordance with the provisions of the Flood Control Act of 1950 (Public Law 516, 81st Cong.) and the President's letter of May 19, 1950, pertaining to this act, the Bureau of Reclamation is participating in the preparation of a comprehensive report for the development and utilization of the national resources of the Arkansas-White-Red River Basins. Region 7 and upper Arkansas River area offices are responsible for the Bureau's participation in investigations in the upper Arkansas River Basin, from the headwaters of the Arkansas River in Colorado to Ellinwood, Kans., as directly contribute to the comprehensive survey for the Arkansas-White-Red Basins.

The plan, for the upper Arkansas River Basin, includes the potential Gunnison-Arkansas project consisting of transmountain diversions and other extensive features including reservoirs, canals, covered conduits, tunnels, pumping plants, hydroelectric power plants, and irrigation distribution systems; however, such diverted water would be used exclusively within the State of Colorado in accordance with the Colorado River compact. The many benefits of the basin plan will include new and supplemental irrigation water, hydroelectric power, flood control, silt retention, reduction of stream pollution, municipal water, recreation, wildlife protection and propagation, drainage, salinity control and extensive industrial, commercial, and population growth. Ultimate development of the basin plan will provide irrigation possibilities for 640,000 acres and power capacity of nearly 700,000 kilowatts.

General Power Studies: Colorado, Kansas, New Mexico, Oklahoma, and Texas

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program to provide maximum utilization of power resources. The studies include consideration and study of firming power sources such as coal-fired gas turbines; system planning through use of network analyzers; studies of transmission interconnections with other regions and utility systems; consideration of regional transmission requirements; coordination of plants and systems; and preparation and interchange of technical data incidental to the plans of the Federal Power Commission, other Federal agencies, and State agencies. Annual revision of the region 5 power program as set forth in the Bureau's advance power program to reflect latest plans is also included.

MONTANA

Agricultural Surpluses and Land Development: Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Since the end of World War II, the general question of agricultural surpluses has been given increasing attention. Some individuals have criticized the Reclamation program on the ground that it merely contributes to those surpluses. The purpose of this investigation is to make a careful appraisal of both the short- and long-run effects of land development upon agricultural surpluses. The study will cover both the theoretical and historical aspects of the problem. It will include consideration of all land development in the Nation with special emphasis upon irrigation in the Western States. It will also include a consideration of the dynamics of land development and the related effect upon population, income, and demand for agricultural products.

Bitterroot Valley Project, Montana

PROJECT INVESTIGATIONS

The purpose of the project is to provide irrigation for about 50,000 acres—supplemental water for 48,300 acres and a full supply for 1,700 acres of new land. The project is in the valley of the Bitterroot River, in the southwestern part of

Montana, just west of the Continental Divide. Most of the land is in Ravalli County, with a small area in Missoula County, Mont.

One of the major problems facing development of the project is adoption of a repayment plan which will accurately reflect the benefits to be provided by the development. Such benefits vary widely because of the varying degrees of adequacy of present water supplies as among the different project lands. Basic data on stream flows and water deliveries are lacking, and need to be developed in order to permit closer appraisal of the relative need for supplemental water.

Blackfoot River Project, Montana

PROJECT INVESTIGATIONS

The purpose of this investigation is to inventory all storage and power possibilities in the Blackfoot River Basin, determine their probable feasibility, and recommend further detailed investigations.

Financial Adjustments, Buffalo Rapids Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The project consists of two divisions. The first division, located on the north side of the Yellowstone River between Glendive and Fallon, Mont., was constructed to serve about 15,500 acres of irrigable land. The second division is located on the south side of the Yelllowstone River and contains about 11,600 acres of irrigable land in three separate units surrounding Fallon, Terry, and Zero, Mont. Most of the land was purchased, developed, divided into farm units, and sold by the Department of Agriculture. Practically all of the farm units on the first division have been sold and sale of the remaining second division land is planned for fiscal year 1951 and fiscal year 1952. Irrigation districts have been organized for both divisions. Preparation and negotiation of suitable repayment contracts with the water users of both divisions should be completed at an early date. Considerable work is yet to be done to complete repayment contract negotiations in conformity with provisions of Public Law 336, Eighty-first Congress, first session.

Water Conservation Studies, Buffalo Rapids Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to gather information on land use, water use, distribution according to soil, crop requirements, and project management in order that additional project lands may be brought into production. Increased acreage will permit lower operation and maintenance costs per acre and, at the same time, protect the Government's interest.

Clark Fork Basin, Mont., Idaho, and Wash.

BASIN SURVEYS

The purpose of this investigation is to prepare a basin-wide report outlining ultimate plans of development in the Clark Fork Basin, and to present individual projects for authorization and further investigation. The basin lies in western Montana, northern Idaho, and eastern Washington.

The area of the basin upstream from Lake Pend Oreille of northern Idaho is assigned to the Bureau of Reclamation for investigation and development of multiple-purpose projects under the Bureau-Corps of Engineers agreement of April 11, 1949, on the Columbia River Basin. Development of irrigation projects throughout the basin, moreover, remains a Bureau function. One of the purposes of the investigation will be to fit the plans for reservoirs in the area made by the Corps of Engineers into the over-all plan for development of the basin.

Columbia River Basin, Wash., Oreg., Idaho, Mont., Wyo., Utah, and Nev.

BASIN SURVEYS

The Columbia River drains a watershed of 259,000 square miles in the Pacific Northwest. It has been called the heartland of the northwest. A plan for comprehensive development of the Basin's water resources has been prepared by the

Bureau of Reclamation for the Department of the Interior. A second similar plan has been prepared by the Corps of Engineers of the Department of the Army. These two plans have been coordinated by agreements between the two departments. (Interior's report is H. D. 473, 81st Congress.)

The Bureau of Reclamation has a number of responsibilities for continuing investigations related to the plan for comprehensive development of the Columbia River Basin. These responsibilities stem from recommendations in the Departmental report, from the agreement between the Interior and Army Departments, and from actions of interagency committees in the Pacific Northwest who are concerned, in part, with development of the Columbia River Basin.

Excess Land Survey, Idaho, Montana, Oregon, Washington and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation, which is regionwide, is to gather and analyze all data relating to compliance with the acreage limitations of reclamation law and to bring all violations into compliance with the law and with the irrigation districts' contracts with the United States. A periodical inventory of this nature is necessary because of the constantly changing pattern of land holdings.

Frenchtown Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of the investigation is to provide factual data for equitable adjustment of the present repayment contract with the Frenchtown irrigation district. The present contract is of the step-up type requiring increasing annual construction installments as time goes on without regard to water users' ability to pay or to fluctuating economic conditions.

General Power Studies, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program which would enable maximum economic development and utilization of power and water resources of the area. Full development of the region's power plan will require technical studies for (1) the planning of a program for development of power resources and power systems or parts thereof, (2) the marketing and sale of power, and (3) the establishment of rate schedules.

These power studies involve power plant, system and intersystem planning, as well as power site and capacity determinations, transmission requirements, coordination of plants and systems, technical studies for the development of power resources, the marketing and sale of power, the establishment of rate schedules, average rate and repayment studies covering existing and proposed projects and estimated financial operation until complete return of costs borne by power are effected, and preparation and interchange of technical data incidental to the plans of other agencies. Such agencies include Corps of Engineers, Bonneville Power Administration, public and privately owned utilities, State power administrations, Federal Power Commission, and other State and Federal agencies.

Financial Adjustments, Huntley Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The project is located on the south bank of the Yellowstone River between Huntley and Pompeys Pillar, Montana and is operated by the Huntley project irrigation district. The water users requested an amendatory repayment contract under section 8 of the act of 1939 in 1941 but negotiations were never completed for the revised contract. It is questionable whether the water users would be interested in entering into an amendatory repayment contract based on ability to pay which will require payments practically as large as current payment. A determination will be made during fiscal year 1951 whether further negotiations are desired by water users. If further negotiations are not desired no further action will be taken by the Bureau at this time. A final report will be submitted.

Water Conservation Studies, Huntley Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of the 5-year program of investigation is (1) to develop plans to bring additional project lands into production, (2) to develop a program of better land use based on proper water measurement and distribution according to soil, crop requirements, and project management. Increase in acreage under irrigation and improved irrigation practices and water control will permit lower operation and maintenance costs, increase water user's income and protect the Government's interest.

The project is located on the Yellowstone River near Huntley, Mont.

Kalispell Project, Montana

PROJECT INVESTIGATIONS

This investigation will determine the feasibility of the irrigation development of approximately 50,000 acres of land in the Flathead Valley of western Montana. The project area is a short distance southwest of Glacier National Park. The city of Kalispell is near the southwest edge of the area. Most of the land which would be irrigated by the project is now dry-farmed.

Water supplies for the project would be pumped from the adjacent Flathead River. Low-cost power is essential to the development.

The west side division of the project, containing about 21,000 acres, lies north and west of the Flathead River. The east side division, embracing about 19,000 acres, is east of that river. The lower valley division, south and west of the river, contains 11,000 acres.

Lolo Creek Project, Montana

PROJECT INVESTIGATIONS

The purpose of this investigation is to inventory all storage sites in the Lolo Creek Basin and to determine their feasibility as possibilities for additional irrigation water which would be used along the lower reaches of Lolo Creek and Bitterroot River. Lolo Creek flows in an easterly direction from the Idaho-Montana border to the Bitterroot River near the town of Lolo in Missoula County, Mont.

Financial Adjustments, Lower Yellowstone Project, Montana and North Dakota

INVESTIGATION OF EXISTING PROJECTS

The project is located in eastern Montana and western North Dakota with headquarters in the town of Sidney, Mont. The system provides for the division of water from the Yellowstone River 18 miles below Glendive, Mont., into a canal on the west side of the river, to the confluence of the Missouri and Yellowstone Rivers. Revised repayment contract to provide for changes in the project obligation as a result of land reclassification approved by Congress in Public Law 602 is to be executed. A determination will be made as to whether water users desire a new type repayment contract. Present agricultural price policies, influence of war activities and nearness to payout of construction cost by many water users have practically eliminated consideration of change in repayment contract terms at this time.

Water Conservation Studies, Lower Yellowstone Project, Montana and North Dakota

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of the 5-year program of investigation is to develop plans for a program of better land and water use based on proper water distribution and measurement according to soil, crop requirements and project management. Improved irrigation practices and water control will permit lower operation and maintenance costs, increased income to water users and protect the Government's interest in the project.

Middle Clark Fork Project, Idaho and Montana

PROJECT INVESTIGATIONS

The project is located on Clark Fork River in Bonner County, Idaho, and Sanders County, Mont.

Purpose of the project is to develop power for irrigation pumping and commercial use at the Cabinet Gorge, Noxon Rapids, and Trout Creek run-of-river power sites, totaling some 657,000 kilowatts of potential power installation.

Financial Adjustments, Milk River Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The primary purpose of the financial adjustment program is to complete negotiations with the Glasgow and Malta irrigation districts for amendatory repayment contracts. The amendatory contracts will establish a new obligation for the districts based on current cost analyses and will include an obligation for required rehabilitation and betterment of project works. A contract will also be negotiated with the Harlem irrigation district for the use of water from the Fresno storage unit.

Rehabilitation Surveys, Milk River Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to obtain data for a preliminary design of the spillway at Sherburne Lakes Dam, Milk River project, and preparation of an estimate of cost of repair or replacement of the structure. Recommendations for repair or replacement of the spillway will be presented in a report and further investigation will be made of methods of financing the construction work required.

Water Conservation Studies, Milk River Project, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of the water conservation and development program on the Milk River project is to carry on several activities designed to place the project on a sound economic and financial basis and to implement the basic policies of the amendatory repayment contracts being negotiated. The proposed program includes (*a*) the development of a program for extensive improvement in land use practices and water use, (*b*) the development of equitable water user assessment schedules to reflect the provisions of the new repayment contract and proposed land reclassification.

Operation and Maintenance Cost and Replacement Analysis, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation is:

1. To obtain a functional breakdown of costs of operating and maintaining irrigation systems.
2. To obtain a functional breakdown of cost of replacement items.
3. To evaluate the extent to which, and under what conditions certain physical and organizational factors influence these costs.
4. To provide a basis for setting up a uniform accounting system which will provide more useful information from operating projects, and develop basic information for forecasting operation and maintenance costs under a wide variety of circumstances.

Detailed data on operation, maintenance, and replacement costs are urgently needed to permit more accurate estimates to be made for projects in the planning phase. Also, operating projects urgently need some criteria which can be used to compare current operation and maintenance and replacement costs; a study of the nature outlined herein would enable criteria to be set up based upon firm experience data.

Small Projects, Western Montana

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation is to improve the land use, soil management, and irrigation practices on the present and proposed projects in western Montana. It will include a study of the soil problem present irrigation practices, methods presently recommended to improve these conditions and means employed to disseminate the information to the farmer. It is proposed that this study be conducted by the experiment station at the State college, the United States Department of Agriculture agencies in that area, and the Bureau of Reclamation. Upon completion of the proposed study it is proposed to draw up a program of remedial measures to improve these conditions which it is hoped will increase crop production and improve the standard of living in western Montana.

Sprinkler Irrigation, Idaho, Montana, Oregon, Washington and Wyoming

GENERAL ENGINEERING AND RESEARCH

Purpose of this investigation is to assemble basic information relating to sprinkler irrigation. Studies will include analysis of the effect on yield, the associated costs related to various land types and crops, and water requirements when application is by sprinkler. The study will be carried out within the region. Such information is necessary for the proper selection of irrigation systems and the determination of feasibility of potential projects. The data obtained from this study will aid not only in the project planning phase, but will be usable on existing projects when the water users consider conversion to sprinkler application.

Rehabilitation Surveys, Sun River Project, Fort Shaw Division, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to carry on surveys and studies of the drainage requirements on the Fort Shaw division. The data obtained will be used to outline the program for rehabilitation and betterment.

Water Conservation Studies, Sun River Project, Greenfields and Fort Shaw Divisions, Montana

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this program is to make various project-wide moisture-retentive studies to gather information on:

(*a*) Number of irrigations required to produce maximum yields of various crops on different soil types.

(*b*) Frequency of irrigations required, and

(*c*) To present a means of measuring the adequacy of the distribution system on the Sun River project.

The other feature of the program will be the preparation of a land reclassification report on the Fort Shaw division lands.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

NEVADA

Carson River Project, California and Nevada

RECONNAISSANCE

The Carson River project is located in west-central Nevada and is situated within what is locally known as the upper Carson Valley. The East and West Forks of the Carson River have their confluence in the valley as they emerge from the eastern slope of the Sierra-Nevada Range.

The purpose of the investigation is to determine the potentialities of conserving water by upstream regulation and consequently, improving irrigation practices to obtain greater utilization of land and water resources in the area. About 30,000 acres are presently inadequately irrigated and are devoted for the most part to native marsh pastures because of an inadequate late season water supply and the swamp conditions produced by the excessive application of water when it is available in the spring season. The swamp conditions in the lower portion of the valley result in excessive consumptive use of water thus preventing full water and land utilization. A reasonably efficient water use in the lower and upper Carson River areas is expected to allow greater beneficial use of the land and water resources. The reconnaissance investigation is to inventory and analyze the various potentialities and to formulate the most desirable basin-wide plan of development for consideration by local and State interests. If found justifiable a detailed investigation of the plan would be undertaken.

Columbia River Basin, Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Nevada

BASIN SURVEYS

The Columbia River drains a watershed of 259,000 square miles in the Pacific Northwest. It has been called the heartland of the Northwest. A plan for comprehensive development of the basin's water resources has been prepared by the Bureau of Reclamation for the Department of the Interior. A second similar plan has been prepared by the Corps of Engineers of the Department of the Army. These two plans have been coordinated by agreement between the two Departments. (Interior's report is H. Doc. 473, 81st Cong.)

The Bureau of Reclamation has a number of responsibilities for continuing investigations related to the plan for comprehensive development of the Columbia River Basin. These responsibilities stem from recommendations in the departmental report, from the agreement between the Interior and Army Departments, and from actions of interagency committees in the Pacific Northwest who sre concerned, in part, with development of the Columbia River Basin.

Fort Mohave Project, Nevada

PROJECT INVESTIGATIONS

At the southernmost tip of Nevada about 2,600 acres of bottom land can be irrigated by pumping from the Colorado River. Power for pumping would be obtained from Davis Dam. In addition the possibilities of irrigating land nearly as far up as Davis Dam will be covered in this investigation.

General Power Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to formulate a regional plan and program for the maximum economic development and utilization of hydroelectric resources of the area. In order to achieve this purpose it is necessary to unify on a region-wide basis the power planning for the various projects, both authorized and proposed, so that the power features of each project will be developed as an integral

part of the entire regional system, coordinated with the plans and efforts of other power producing agencies in the Southwest.

These studies involve system and intersystem planning, power site and capacity investigations, determination of transmission system requirements, coordination of plants and systems, and collection and analysis of power market data, as well as the preparation and interchange of technical information incidental to the plans of Federal and State agencies and utilities in region 3.

Humboldt Project, Nevada

PROJECT INVESTIGATION

The existing Humboldt project is located in Pershing County, Nev., in the basin of the Humboldt River.

Rye Patch Dam, a reservoir of 179,000 acre-feet of capacity on Humboldt River, was constructed by the Bureau of Reclamation from 1935 to 1941 to provide a supplemental water supply for lands in the vicinity of Lovelock. About 30,000 acres of the total project area of 40,000 acres of land are now irrigated. All irrigation, diversion, carriage, and distribution facilities serving the irrigated area were privately constructed.

In the spring of 1945 the Bureau began an investigation of drainage conditions to outline a plan to alleviate seepage and apparent lack of fertility of the soils. The seeped and alkalied areas are due primarily to the prevalence of high groundwater tables and these areas have steadily increased with the added irrigation water provided by Rye Patch Reservoir until now nearly 50 percent of the lands are affected.

The plan of development under consideration includes a system of deep open drains for relieving the seepage condition. A dike would be constructed to protect a portion of the area from inundation by Humboldt River floods and high stages of the Humboldt Lakes. Drainage from the lower third of the irrigated areas would be pumped over the dike into the Humboldt Lakes. The drains serving the upper two-thirds of the area would discharge by gravity into Toulon Sink. Plans are being considered by the Fish and Wildlife Service to develop Toulon Sink into a wildlife refuge. Plans also include the consolidation, relocation and lining of irrigation canals in the project area to eliminate present excessive seepage losses contributing to the high-water tables and to otherwise improve the efficiency of the distribution system.

Lower Colorado River Basin, Ariz., Calif., Nev., N. Mex., and Utah

BASIN SURVEYS

The Bureau is undertaking, as time permits, a comprehensive study of the water supply of the Lower Colorado River Basin to parallel a similar study already made for the upper basin and embodied in the reports, "Final Report, Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, November 28, 1950." The data developed for the lower basin will be basic for general planning purposes involving water resources; it will furnish a factual basis for examination of issues arising from the Colorado River compact and should be helpful in resolving controversial points.

Moapa Valley Project, Nevada

PROJECT INVESTIGATIONS

An existing private irrigation project near Overton, Nev., has irrigated about 2,500 acres of the valley floor along the lower Muddy River. The irrigation flow depended upon comes from springs which discharge about 40 second-feet uniformly throughout the year. Fuller use could be made of the water by storage since it otherwise would be wasted during periods of low demand. The Bureau has investigated storage possibilities, rehabilitation, and betterment of the present distribution system, drainage of seeped lands and a plan for supplying good drinking water.

Financial Adjustments, Newlands Project, Nevada

INVESTIGATION OF EXISTING PROJECTS

The Newlands project (formerly the Truckee-Carson project) is located in the valley of ancient Lake Lahontan in western Nevada in the vicinity of the town of Fallon. Operation and maintenance was transferred to the Truckee-Carson

Irrigation District on January 1, 1927. The ultimate irrigable area of the project is considered to be 87,500 acres, of which about 69,500 are covered by individual water right applications and contracts, and about 60,000 acres are being irrigated.

The amount of the district's reimbursable construction cost obligation was about $3,282,000 including $945,000 for drainage construction, Truckee canal improvements in the amount of $150,000 and a deficit of $500,000 (repayable from the sale of additional water rights), representing, except for those general items, the aggregate of obligations under water users' individual water-right contracts. All accruals to date have been paid in full.

The purpose of the investigation is to reclassify temporarily unproductive class 5 lands; to classify and determine what additional lands might be opened to homestead entry; and what nonapplication private land can be placed under contract.

Rehabilitation Surveys, Newlands Project, Nevada

INVESTIGATION OF EXISTING PROJECTS

The Newlands project (formerly the Truckee-Carson project) is located in the valley of ancient Lake Lahontan in western Nevada in the vicinity of the town of Fallon. The ultimate irrigable area of the project is considered to be 87,500 acres, of which about 69,500 are covered by individual water right applications and contracts, and about 60,000 acres are presently being irrigated.

The project plan as developed by the United States includes the Lahontan Dam on the Carson River creating a reservoir of 273,600 acre-feet capacity, outlet works of Lake Tahoe (732,000 acre-feet capacity), on the Truckee River, diversion dams on the Truckee and Carson Rivers, 104 miles of canal, 504 miles of laterals, 339 miles of open drains, and a power plant of 1,500 kilowatt capacity. Subsequent to assuming the operation and maintenance of the project on January 1, 1927, the Truckee-Carson irrigation district has acquired or constructed additional facilities.

The purpose of the investigation is to determine the extent, need, and costs for rehabilitating and bettering project works. Due to natural deterioration and the inability of the Truckee-Carson irrigation district to obtain labor, materials, and supplies during the war period, certain structures are in need of rehabilitation and betterment.

Water Conservation Studies, Newlands Project, Nevada

INVESTIGATION OF EXISTING PROJECTS

The Newlands project (formerly the Truckee-Carson project) is located in the valley of ancient Lake Lahontan in western Nevada in the vicinity of the town of Fallon. The ultimate irrigable area of the project is considered to be 87,500 acres, of which about 69,500 are covered by individual water right applications and contracts, and about 60,000 acres are presently being irrigated.

The purpose of the investigation is to determine the adequacy of the water supply for presently irrigated lands and potential extensions in the area served by the project. Under the contract dated December 18, 1926, the Truckee-Carson irrigation district was granted a prior right to the beneficial use of water on 87,500 acres of the Newlands project as against any future development by the United States on the Truckee and Carson Rivers above the Newlands project. Therefore the completion of water conservation studies is of importance in connection with ultimate plans for additional irrigation development in the Truckee and Carson River Basins.

Sedimentation Studies, Including Quality of Water Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

Since the Colorado River and its tributaries carry unusually large quantities of silt, it becomes necessary to determine these quantities adequately for design purposes in order that Bureau reservoirs may have ample capacity, silt considered, and to estimate the probable useful life of reservoirs, both constructed and prospective. Future reservoirs such as Glen Canyon, Marble Canyon, Coconino, Bridge Canyon, and reservoirs on the Dixie project must all be designed with large allowances in capacity for silt retention. The Geological Survey has been carrying on a cooperative program of silt sampling on the Colorado River at Lees Ferry,

Ariz., the Little Colorado River at Cameron, Ariz., and the Virgin River at Littlefield, Ariz. Quality of water determinations are also made as an incident of this work.

Storm Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

For determination of size of spillways, and freeboard of dams, and allowances to make for flood heights and flood damages, the engineer depends upon the results of storm analyses. The Bureau of Reclamation has an agreement with the Army at commissioner level to divide up the field of storm studies so that no duplication will result and so that each agency will have the results of the other's work. The regional office carries on such studies in Boulder City.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

Washoe Project, California and Nevada

PROJECT INVESTIGATIONS

The area under investigation is located in California and Nevada in the basin of the Truckee River in the general vicinity of Reno, Nev.

Purpose of the investigation is to obtain greater utilization of the water and land resources in the basin. The construction of upstream storage is expected to provide greater power generation to replace insecure importations from plants in California west of the Sierra-Nevada Range and a greater and more efficient use of the water for irrigation. The extent and means of accomplishing this purpose is to be determined by reconnaissance studies scheduled for completion in fiscal year 1951.

Washoe Project, California and Nevada

RECONNAISSANCE

The area under investigation is located in California and Nevada in the basin of the Truckee River in the general vicinity of Reno, Nev.

Purpose of the investigation is to outline potentialities for further irrigation and power development in the Truckee River Basin and other possible water uses. Partial regulation and use of the water resources of the basin have been accomplished by the construction of Boca Reservoir and the Lake Tahoe outlet dam by the Bureau of Reclamation and the Donner Lake and Independence Lake Reservoirs by private interests. Additional power development on the stream would replace insecure power imports from plants in California west of the Sierra-Nevada Range and alleviate the serious power shortage in the area. Improvements in Truckee River water regulation would permit a more efficient use by downstream irrigators.

A number of plans of development have been proposed. These plans generally involve dams on Prosser Creek and Little Truckee River and releases from Boca Reservoir through a pressure tunnel to a power drop of 420 feet to Truckee River. These possibilities are being studied to determine the most desirable plan for additional development in the Truckee River Basin and whether a detailed project investigation would be justified.

NEW MEXICO

Animas-La Plata Project, Colorado and New Mexico

PROJECT INVESTIGATIONS

The project area is located in La Plata County in southwestern Colorado and San Juan County in northwestern New Mexico in the basin of the San Juan River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities for utilizing regulated flows of the Animas and La Plata Rivers, tributaries of the San Juan River, for irrigation, production of power, protection from flood damage, and silt detention.

With this project, the waters of the Animas and La Plata Rivers would be fully utilized. Supplemental water could be furnished to 27,000 acres of insufficiently irrigated land in the La Plata River Basin and a full supply for about 86,000 acres of new land in that basin and adjacent areas, including 25,500 acres on the Navajo Indian Reservation in New Mexico.

Carlsbad Project, New Mexico

PROJECT INVESTIGATIONS

The Carlsbad irrigation district, including all the works for storage, diversion, and delivery of water thereto, is in the Pecos River Basin, a subbasin of the Rio Grande. The irrigated project lands are in Eddy County, southeast New Mexico, near the town of Carlsbad. The purpose of the plan to be investigated is to furnish the Carlsbad project with a more adequate and dependable water supply by construction of a conveyance channel through the McMillan Reservoir delta to rehabilitate the existing distribution system and to insure the safety of the existing Alamogordo Dam through increasing the spillway capacity. The improvements would provide an adequate water supply for the 25,055 water-right acres within the Carlsbad project. They would also reduce the water losses in the McMillan delta area, thereby increasing the amount of water available for irrigation in the Pecos Subbasin.

Central Arizona Project, Arizona and New Mexico

PROJECT INVESTIGATIONS

For a detailed description of the project see Project Planning Report No. 3–8b.4–2 and House Document No. 136, Eighty-first Congress, first session. Both are on the subject of the Central Arizona Project.

The main object of the Central Arizona project is to furnish supplemental water, principally from the Colorado River, to land on the flood plains of the Gila River and some of its tributaries upstream from Gillespie Dam. The project will make use of power heads for the development of hydroelectric power needed for project pumping and for general commercial use; it will supply Tucson with additional municipal water; it will distribute available water to better advantage by exchange of water rights; and it will produce benefits from sediment retention, flood control, salinity control, preservation of fish and wildlife, and the promotion of recreation. The plan is to pump water from Lake Havasu on the Colorado River to a 235-mile lined canal about a thousand feet higher, thence carry the water in the lined canal to Granite Reef Dam, about 25 miles easterly from Phoenix, for distribution, or to the nearby potential McDowell Dam for storage pending distribution; to carry water from Sehuaro Reservoir on Salt River to Picacho Reservoir on the Gila plain 13 miles southerly from Florence, thereby to provide more water where needed through exchange of water rights; to effect economics in the Safford area by consolidation of the present distribution systems; to make more water available to the upper Gila River system through storage of water on the Gila and through exchange of water rights; to provide flood control,

storage for irrigation and some power by building a dam on the Buttes site of the Gila River about 10 miles upstream from Florence; to provide Tucson with additional municipal water from a reservoir to be created on the San Pedro River 12 miles southwest of Tombstone; and to provide for power and additional storage by enlarging Horseshoe Reservoir which is 30 miles upstream from the mouth of the Verde River. A large amount of power would be developed at the potential Bridge Canyon Dam on the Colorado River at the head of Lake Mead to augment Southwest power and to considerably more than offset any power taken by this project for pumping. To prolong the life of Bridge Canyon Reservoir, sediment from the Little Colorado River would be detained at the potential Coconino Reservoir near Cameron, Ariz., and sediment from the Colorado River above the Utah line will be retained by the potential Glen Canyon Dam of region 4, the later dam not a feature of the central Arizona project.

Colorado River Storage Project, Colorado, New Mexico, Utah, and Wyoming

PROJECT INVESTIGATIONS

The project area includes upper Colorado River Basin lands and adjacent lands in the States of Colorado, New Mexico, Utah, and Wyoming. To permit these States to beneficially consume their share of Colorado River water as apportioned by the 1922 Santa Fe compact and fulfill their obligations for downstream delivery as further specified therein, reservoir storage must be provided for hold-over of surplus flows during periods of high runoff to supplement reduced river flows at Lee Ferry in low runoff periods.

The purpose of this investigation is to determine a system of reservoirs that will yield the maximum water supply for irrigation by confining reservoir storage losses to an economic minimum, and simultaneously accomplish all other possible purposes of multiple-purpose operation, including river regulation, power development, recreation, fish and wildlife conservation, and sediment retention.

Colorado River Storage Project, Navajo Unit, New Mexico

PROJECT INVESTIGATIONS

The damsite for this unit is located on San Juan River about 3 miles downstream from Pine (Los Pinos) River confluence in northwestern New Mexico. Under the present storage project plan the Navajo Reservoir would provide the only large capacity regulatory storage on San Juan River. Initially the power potential at the site could be utilized to generate electric energy. Ultimately the unit may be used almost exclusively for irrigation storage to enable New Mexico to consume its compact allotment of upper Colorado River water.

General Power Studies: Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to formulate a regional plan and program for the maximum economic development and utilization of hydroelectric resources of the area. In order to achieve this purpose it is necessary to unify on a region-wide basis the power planning for the various projects, both authorized and proposed, so that the power features of each project will be developed as an integral part of the entire regional system, coordinated with the plans and efforts of other power producing agencies in the Southwest.

These studies involve system and intersystem planning, power site and capacity investigations, determination of transmission system requirements, coordination of plants and systems, and collection and analysis of power market data, as well as the preparation and interchange of technical information incidental to the plans of Federal and State agencies and utilities in region 3.

General Power Studies, Colorado, Kansas, New Mexico, Oklahoma, and Texas

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the Regional power plan and program to provide maximum utilization of power resources. The studies include consideration and study of firming power sources such as

coal-fired gas turbines; system planning through use of network analyzers; studies of transmission interconnections with other regions and utility systems; consideration of Regional transmission requirements; coordination of plants and systems; and preparation and interchange of technical data incidental to the plans of the Federal Power Power Commission, other Federal agencies, and State agencies. Annual revision of the Region 5 power program as set forth in the Bureau's advance power program to reflect latest plans is also included.

Hammond Project, New Mexico

PROJECT INVESTIGATIONS

The project area is located in San Juan County, northwestern New Mexico, and is in the basin of the San Juan River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities of diverting waters of the San Juan River to irrigate 3,670 acres of new lands adjacent to San Juan River.

The project plan involves construction of a diversion dam on San Juan River, a main gravity canal, and a hydraulic turbine-driven pumping plant with a water life of 49 feet, a high-line canal, and a lateral and drainage system.

Lower Colorado River Basin, Arizona, California, Nevada, New Mexico, and Utah

BASIN SURVEYS

The Bureau is undertaking, as time permits, a comprehensive study of the water supply of the Lower Colorado River Basin to parallel a similar study already made for the Upper Basin and embodied in the report, Final Report, Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, November 28, 1950. The data developed for the Lower Basin will be basic for general planning purposes involving water resources; it will furnish a factual basis for examination of issues arising from the Colorado River compact and should be helpful in resolving controversial points.

Middle Rio Grande Project, New Mexico

ADVANCE PLANNING

The Middle Rio Grande project lies in the Middle Rio Grande Valley in the north central part of New Mexico. It extends from the Colorado-New Mexico boundary south to the backwaters of Elephant Butte Reservoir. Development of the project is a joint undertaking of the Corps of Engineers and the Bureau of Reclamation.

The Bureau of Reclamation is concerned primarily with the irrigation and local drainage phases of the general plan, and a Bureau report thereon was approved by the Secretary of the Interior on October 21, 1947. Bureau plans provide for rehabilitation and extension of existing irrigation and drainage systems serving approximately 84,900 acres in the Middle Rio Grande Conservancy District, together with such channel rectification and improvement of the Rio Grande main channel as is necessary to accomplish these purposes. Construction of storage facilities for irrigation and flood control, together with related flood control and major drainage works, is delegated to the Corps of Engineers under the "Joint agreement between the Secretary of the Interior and the Secretary of the Army on a unified plan for control of floods, irrigation, and use of water in the Middle Rio Grande Basin in New Mexico."

Construction of the channel is of first priority because of the urgent need to convey waters of the Rio Grande through an area where losses due to nonbeneficial consumptive use of native vegetation are so great that New Mexico can no longer meet obligations under the Rio Grande compact. At the present rate of debit increase, the compact would require cessation of normal irrigation in the Middle Rio Grande Valley in the near future. Huge water losses in the delta area above Elephant Butte Reservoir are reducing water available for irrigation of 156,000 acres of land in New Mexico and Texas and production of hydroelectric power to be used in defense areas such as Albuquerque, N. Mex. and El Paso, Tex.

Rehabilitation and extension of the existing works of the Middle Rio Grande Conservancy District are less urgent, but vitally needed to protect and increase productive capacity of lands which include some 21,000 acres of Indian lands.

Pecos River Basin, New Mexico and Texas

BASIN SURVEYS

The Pecos River rises in the western portion of Mora County in New Mexico and flows southerly to enter the Rio Grande in Valverde County, Tex. The basin contains many irrigation projects in both New Mexico and Texas, some of which have water rights dated back several hundred years. The vested rights on the stream exceed the available flows, and water shortages are suffered generally throughout the basin. Several investigations and reports on its water problems have been made by appropriate Federal, State, and private interests. An interstate compact to provide for the division of Pecos River waters was recently negotiated and approved by New Mexico, Texas, and the United States. Investigations in the basin are being directed toward formulation of a comprehensive basin plan which will provide for the optimum utilization of the water and land resources and power potential of the basin within the provisions of the Pecos River compact.

Pine River Project Extension, Colorado and New Mexico

PROJECT INVESTIGATIONS

The project area is located in La Plata and Archuleta Counties, southwestern Colorado, San Juan County, northwestern New Mexico, and is in the basin of the San Juan River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities for using the surplus flow of Pine River and its tributaries, supplemented by storage from the existing Vallecito Reservoir, to irrigate 15,100 acres of new land. This new land is in the vicinity of Ignacio, Bayfield, and Arboles, Colo.

Rio Grande Project, New Mexico and Texas

INVESTIGATION OF EXISTING PROJECT

The Rio Grande project located in New Mexico and Texas, consists of approximately 155,000 acres of irrigable land. During the past 2 years an investigation has been under way to develop plans, programs, and cost estimates for the rehabilitation of the project works. It is now proposed to extend the investigation to include field surveys, economic studies and preconstruction designs for the improvement of community ditch facilities located within the El Paso County water improvement district No. 1. These areas are immediately adjacent to the city of El Paso, both above and below, and are becoming highly developed and congested. It is estimated at the present time that within the area between El Paso and Ysleta there are approximately 15,000 to 18,000 people in residence; while in the area known as the country club district immediately above El Paso, it is estimated between 3,000 and 4,000 are in residence. The Bureau maintains the water-delivery point from the main canal and laterals the same as was the case when these areas were in farms; the rapid growth and the change from farm units to small-home units have created a condition approaching chaos with respect to an efficient system of water delivery and maintenance of ditches by the individual water users. The people who own property in these community ditch areas are all members of the El Paso County water improvement district No. 1, and pay all the annual assessments for operation and maintenance, construction, and reservoir-service charges, the same as any average water user; however, they do not obtain the same type of service that is given to the average farmer. Recognition of this condition indicates the necessity for an investigation which will lead to a solution of a very unsatisfactory problem now existing on the community ditches.

The residents in these areas have not been able to operate effectively their community ditch systems, nor to maintain them properly with the result that frequent flooding of property, court actions, etc., are becoming more and more numerous each year. In order to overcome these conditions now existing among the members of the El Paso County water improvement district No. 1, the investigation is proposed to determine ditch systems that will, in effect, be self-cleaning, and which may be regulated more efficiently than under the present haphazard manner of service.

Rio Grande Project, Caballo Power Plant, New Mexico

PROJECT INVESTIGATIONS

The potential Caballo hydroelectric-generating plant would be a part of the Rio Grande project power system and would be located at the existing Caballo Dam, approximately 20 miles downstream from the Elephant Butte hydroelectric power plant dam and reservoir, south of the town of Hot Springs, N. Mex.

Preliminary studies have already been made of this potential project based on a 17,500-kilowatt installation in two units. The purpose of the continuing investigation is to reexamine the feasibility of the project on the basis of more accurate estimates and possibly more detailed field surveys.

The potential development would consist of a power canal from the tail water of Elephant Butte hydroelectric plant to Caballo, a power-drop plant at the terminus of the power canal and an additional unit at the toe of the dam which would be used both as a generating unit and as a pumping unit for pumping water back into the reservoir from tail-water storage.

San Juan-Chama Project, Coloardo and New Mexico

PROJECT INVESTIGATIONS

The area involved in the San Juan-Chama project includes the upper reaches of the San Juan River in southwestern Colorado and the entire watershed of the Rio Grande in New Mexico. In addition, small areas of the Canadian and Pecos River watersheds become involved because of other potential small transbasin diversions.

The Rio Grande Valley is the region in which the first settlement by European immigrants in the United States occurred. Over a long period of time, the increase of population at a rate faster than the increase in means of subsistence has resulted in an acute need for expanding the land base. The pressure of population on the land resources probably is not exceeded anywhere else in the Nation.

The plan to be investigated would transfer the divertible waters of the San Juan River to the Rio Grande Basin, where they would be used for the multiple-purposes of power generation, fish and wildlife propagation, recreation development, and for application to new lands or as a supplemental water supply to lands now irrigated. The plan might include provision for supplying the municipal requirements of national-defense establishments and urban communities in the area.

The purpose of the investigations is to determine, first, the relative advantages to New Mexico of the potential uses of the available water in the San Juan Basin and the Rio Grande Basin. From this information, a decision will be made on the amount of water to be diverted to the Rio Grande. The most feasible of the potential uses in the Rio Grande will then be selected for the plan of development on the basis of all factors involved. During fiscal years 1951 and 1952, the investigations would be directed toward—

(1) Inventory of potential water uses in the Rio Grande watershed;

(2) Program report on the portion of the project lying upstream from the mouth of the Rio Chama; and

(3) Program report on the water-use portion of the project lying downstream from the mouth of the Rio Chama.

Sedimentation Studies Including Quality of Water Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

Since the Colorado River and its tributaries carry unusually large quantities of silt, it becomes necessary to determine these quantities adequately for design purposes in order that Bureau reservoirs may have ample capacity, silt considered, and to estimate the probable useful life of reservoirs both constructed and prospective. Future reservoirs such as Glen Canyon, Marble Canyon, Coconino, Bridge Canyon, and reservoirs on the Dixie project must all be designed with large allowances in capacity for silt retention. The Geological Survey has been carrying on a cooperative program of silt sampling on the Colorado River at Lees Ferry, Ariz., the Little Colorado River at Cameron, Ariz., and the Virgin River at Littlefield, Ariz. Quality of water determinations are also made as an incident of this work.

South San Juan Project, New Mexico.

PROJECT INVESTIGATIONS

The project area is located in northwestern New Mexico, in the basin of the San Juan River, a tributary of the upper Colorado River.

The purpose of the investigation is to determine the possibilities of developing a water supply for irrigation of arable lands south of San Juan River lying generally south of the town of Farmington, N. Mex. Under the tentative project plan, storage regulation of San Juan River would be provided at the Navajo site on that stream and a canal distribution system would extend from the reservoir to serve 20,000 acres of land. The reservoir and a portion of the canal would be used jointly by the South San Juan project and the potential 114,000-acre Shiprock project which is being investigated by the Bureau of Indian Affairs in cooperation with the Bureau of Reclamation.

The South San Juan and Shiprock projects are competitive to a certain degree for a water supply with the potential San Juan-Chama project, an upstream transmountain diversion plan. Should the latter project not be selected for development, the acreage of the South San Juan project would be larger, serving a maximum of about 68,000 acres, of which approximately 29,000 acres would be on the Navajo Indian Reservation.

Storm Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

For determination of size of spillways and freeboard of dams and allowances to make for flood heights and flood damages, the engineer depends upon the results of storm analyses. The Bureau of Reclamation has an agreement with the Army at Commissioner level to divide up the field of storm studies so that no duplication will result and so that each agency will have the results of the other's work. The regional office carries on such studies in Boulder City.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand, there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand, there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the "united western investigation" is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supply these water deficient areas with a portion of the vast water surpluses in the areas of the northwest.

Vermejo Project, New Mexico

ADVANCE PLANNING

The potential project, located in the Canadian River Basin in Colfax County, northeastern New Mexico, includes rehabilitation of existing irrigation works together with provision of additional engineering structures required. Development of the project would provide for replacement of lost storage, improvement of delivery and distribution systems, drainage facilities, flood protection, and developments for fish and wildlife and recreational resources. The purpose of these investigations is to accomplish preconstruction work that will permit construction to be initiated as early as possible. This project was authorized September 27, 1950.

NORTH DAKOTA

Financial Adjustments, Buford-Trenton Project, North Dakota

INVESTIGATIONS OF EXISTING PROJECTS

The project is located in western North Dakota, on the north bank of the Missouri River in the vicinity of the towns of Buford and Trenton. The project is operated by the Buford-Trenton Mutual Aid Association, formerly under the supervision of the Soil Conservation Service, but has been transferred to the Bureau of Reclamation for operation and maintenance supervision and the negotiation of a repayment contract.

The purpose of the work is to provide assistance in the formation of an irrigation district, development and negotiation of a suitable repayment contract and assistance in securing repayment contract compliance. The project has been in operation since 1944, and it is to the interest of the Government to complete repayment contract arrangements at an early date.

Water Conservation Studies, Buford-Trenton Project, North Dakota

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of the 5-year program of investigation is to develop plans for a program of better land use based on proper water measurement and distribution according to soil, crop requirement, and project management. Improved irrigation practices and control of water will increase income to the water users, permit lower operation and maintenance costs and protect the Government's interest in the project. Studies of river-bank erosion will be made, leading to a report of damage and program for control.

Financial Adjustments, Lower Yellowstone Project, Montana and North Dakota

INVFSTIGATION OF EXISTING PROJECTS

The project is located in eastern Montana and western North Dakota with headquarters in the town of Sidney, Mont. The system provides for the division of water from the Yellowstone River 18 miles below Glendive, Mont., into a canal on the west side of the river, to the confluence of the Missouri and Yellowstone Rivers. Revised repayment contract to provide for changes in the project obligation as a result of land reclassification approved by Congress in Public Law 602 is to be executed. A determination will be made as to whether water users desire a new-type repayment contract. Present agricultural price policies, influen e of war activities and nearness to pay-out of construction cost by many water users have practically eliminated consideration of change in repayment contract terms at this time.

Water Conservation Studies, Lower Yellowstone Project, Montana and North Dakota

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of the 5-year program of investigation is to develop plans for a program of better land and water use based on proper water distribution and measurement according to soil, crop requirements, and project management. Improved irrigation practices and water control will permit lower operation and maintenance costs, increased income to water users and protect the Government's interest in the project.

OKLAHOMA

Canton Project, Oklahoma

PROJECT INVESTIGATIONS

The potential Canton project is located on the North Canadian River, approximately 65 miles northwest of Oklahoma City. Irrigation of 16,000 acres would be accomplished from Canton Reservoir which was recently completed by the Corps of Engineers, Department of the Army. A project report covering the Canton irrigation project was completed by the Bureau of Reclamation in October 1948. Since that date officials of the city of Enid, Okla., have indicated an

interest in obtaining the assistance of the Bureau toward obtaining a municipal water supply from Canton Reservoir.

The purpose of this reinvestigation is to consider the possibility of supplying the city of Enid, Okla., with municipal water from Canton Reservoir and completion of a project report.

General Power Studies: Colorado, Kansas, New Mexico, Oklahoma, and Texas

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program to provide maximum utilization of power resources. The studies include consideration and study of firming powers sources such as coal-fired gas turbines; system planning through use of network analyzers; studies of transmission interconnections with other regions and utility systems; consideration of regional transmission requirements; coordination of plants and systems; and preparation and interchange of technical data incidental to the plans of the Federal Power Commission, other Federal agencies, and State agencies. Annual revision of the region 5 power program as set forth in the Bureau's advance power program to reflect latest plans is also included.

Washita River Subbasin, Oklahoma

BASIN SURVEYS

The Washita River rises in Hemphill County, Tex., and extends some 270 miles across southwestern Oklahoma to join the Red River near Denison, Tex. Investigations in the basin are being directed toward determining means for beneficially using the waters of the Washita River in an integrated development for irrigation, flood control, municipal water supply, recreation, fish and wildlife, and other purposes. Development of hydroelectric power probably will not be feasible, but will be considered with other possibilities. There is practically no irrigation in the valley at this time; however, investigations indicate that about 40,000 acres could be irrigated if storage is provided.

OREGON

Agricultural Surpluses and Land Development—Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Since the end of World War II, the general question of agricultural surpluses has been given increasing attention. Some individuals have criticized the reclamation program on the ground that it merely contributes to those surpluses. The purposes of this investigation is to make a careful appraisal of both the short- and long-run effects of land development upon agricultural surpluses. The study will cover both the theoretical and historical aspects of the problem. It will include consideration of all land development in the Nation with special emphasis upon irrigation in the Western States. It will also include a consideration of the dynamics of land development and the related effect upon population, income, and demand for agricultural products.

Baker Project, Upper Division, Oregon

PROJECT INVESTIGATIONS

The project area is located in Baker County, Oreg., in the basin of Powder River, a tributary of Snake River. The lands lie along Powder River in Baker and Bowen Valleys near Baker, the county seat.

Purpose of the investigation is to determine the possibilities for storage of surplus river flows to provide needed supplemental water for up to 50,000 acres of lands now inadequately irrigated and to coordinate the proposed development with flood-control recommendations of the Corps of Engineers. Other divisions of the Baker project are the Wolf Creek Division, scheduled for active investigation in fiscal year 1952, and the operating lower division.

Baker Project, Wolf Creek Division, Oregon

PROJECT INVESTIGATIONS

The project is located in Union County, Oreg., near the mouth of Wolf Creek, which joins Powder River just above the existing Thief Valley Reservoir of the lower division of Baker project. The investigation will determine the feasibility of providing supplemental water for about 7,000 acres of inadequately irrigated land by the development of storage on Wolf Creek.

Butter Creek Project, Oregon

PROJECT INVESTIGATIONS

The purpose of the project is to provide supplemental water to about 8,000 acres of inadequately irrigated land and an adequate supply to about 4,000 acres of new land. The investigation will involve the location of a suitable storage site, a distribution system, and economic, geologic, and hydrologic studies. Incidental benefits may accrue to wildlife preservation and propagation.

The project area lies in Morrow and Umatilla Counties, Oreg., along Butter Creek, a tributary of the Umatilla River.

Columbia River Basin, Wash., Oreg., Idaho, Mont., Wyo., Utah, and Nev.

BASIN SURVEYS

The Columbia River drains a watershed of 259,000 square miles in the Pacific Northwest. It has been called the heartland of the Northwest. A plan for comprehensive development of the basin's water resources has been prepared by the Bureau of Reclamation for the Department of the Interior. A second similar plan has been prepared by the Corps of Engineers of the Department of the Army. These two plans have been coordinated by agreement between the two departments. (Interior's report is H. Doc. 473, 81st Cong.)

The Bureau of Reclamation has a number of responsibilities for continuing investigations related to the plan for comprehensive development of the Columbia River Basin. These responsibilities stem from recommendations in the departmental report, from the agreement between the Interior and Army Departments, and from actions of interagency committees in the Pacific Northwest who are concerned, in part, with development of the Columbia River Basin.

Crooked River Project, Oregon

PROJECT INVESTIGATIONS

The purpose of the investigation is to explore the possibilities of developing a project that will furnish supplemental water to 9,990 acres of irrigated lands and a full water supply for 10,220 acres of dry land and unspecified lands where present supplies are inadequate. The plan included rehabilitation of Ochoco Dam, now completed, and construction of an additional reservoir on Crooked River to provide flood control, irrigation water, and wildlife and recreational benefits.

Deschutes Project, Domestic Water Supply, Oregon

PROJECT INVESTIGATIONS

The north unit of the Deschutes project is located in Jefferson County, Oreg. The central part of the area is some 40 miles north of Bend. The unit is about 30 miles long from north to south and ranges from 2 to 12 miles in width. The north unit of the Deschutes project is in the latter part of the construction phase. The project contains 50,000 acres of irrigable lands.

The domestic water system is not a part of the plan of development for the Deschutes project, north unit. An independently owned system has been furnishing supplies to some farmers in the area, to the city of Madras and to other smaller communities. The growth of the area, primarily the result of increased irrigation, has made the problem of the domestic water supply system acute. Individual developments for domestic water are not practical in many locations. Therefore, consideration has been given to the rehabilitation and reconstruction of the

existing system. The purpose of the domestic water investigation for the north unit of the Deschutes project is to prepare a plan by which the settlers in the area as well as the town of Madras and other communities including Metolius, Culver, and Opal City can be furnished a dependable source of domestic water.

Supplemental Storage, Deschutes Project, Oregon

PROJECT INVESTIGATIONS

Supplemental storage for Deschutes project is necessary to provide a supply of irrigation water to lands in central Oregon with present inadequate supplies. Specifically, additional storage space is needed to supplement the capacity of the existing storage reservoirs of Deschutes project which have a useful capacity, because of geologic conditions of less than the designed capacity.

Prospective storage sites to be investigated include those at Benham Falls and Crescent Lake.

The study does not include consideration of alternative possibilities for beneficial use of water.

Excess Land Survey, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation, which is region-wide, is to gather and analyze all data relating to compliance with the acreage limitations of reclamation law and to bring all violations into compliance with the law and with the irrigation districts, contracts with the United States. A periodical inventory of this nature is necessary because of the constantly changing pattern of land holdings.

General Power Studies, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program which would enable maximum economic development and utilization of power and water resources of the area. Full development of the region's power plan will require technical studies for (1) the planning of a program for development of power resources and power systems or parts thereof, (2) the marketing and sale of power, and (3) the establishment of rate schedules.

These power studies involve power plant, system and intersystem planning, as well as power site and capacity determinations, transmission requirements, coordination of plants and systems, technical studies for the development of power resources, the marketing and sale of power, the establishment of rate schedules, average rate and repayment studies covering existing and proposed projects and estimated financial operation until complete return of costs borne by power are effected, and preparation and interchange of technical data incidental to the plans of other agencies. Such agencies include Corps of Engineers, Bonneville Power Administration, public and privately owned utilities, State power administrations, Federal Power Commission, and other State and Federal agencies.

Goose Lake Project, Oregon

PROJECT INVESTIGATIONS

The purpose of the investigation is to explore the possibilities of developing a project that will furnish supplemental water to the present project area of 10,210 acres presently receiving inadequate supplies. The project is located in the interior drainage basin of south-central Oregon in Lake County, in the vicinity of Goose Lake.

The tentative plan is to utilize two reservoirs presently in operation but in need of rehabilitation and to utilize the present distribution system without rehabilitation or extension.

Grande Ronde Project, Oregon

PROJECT INVESTIGATIONS

The project area containing an estimated 63,500 irrigable acres, of which about 16,000 are now irrigated, lies in the vicinity of La Grande in Union County, Oreg.

The purpose of this investigation is to bring the original report on the project which was prepared in 1941 up to present policy requirements and present investigative standards. Since the original investigation was made the Corps of Engineers, Department of the Army, has initiated a new detailed flood-control investigation, the results of which are to be integrated with the irrigation-development plan. In addition, the lands have been reclassified to present irrigability standards. The revised project report which will result from the present investigation will therefore require changes in engineering plans and water-supply studies, as well as a new economic analysis based on present methods of irrigation evaluation

Grants Pass Project, Savage Rapids Dam, Oregon

PROJECT INVESTIGATIONS

This investigation is to determine general state of repair of the facilities of the Grants Pass irrigation district and specifically to determine extent of rehabilitation needed on Savage Rapids Dam located on Rogue River (5 miles east of Grants Pass), which provides the main source of water supply for the district by diversion. District lands extend along both sides of Rogue River from village of Rogue River to the confluence of the Rogue and Applegate Rivers and are bounded on the north by foothills of the Umpqua Range and on the south by the Siskiyou Mountains.

Hells Canyon Project, Idaho and Oregon

PROJECT INVESTIGATIONS

This project is located on the Snake River on the Idaho-Oregon State line, 108 miles upstream from Lewiston, Idaho, and 94 miles downstream from Weiser, Idaho.

The general plan provides for the construction of a high dam in the canyon section of the Snake River between the Blue Mountains of Oregon and the Seven Devil Mountains of Idaho. The project consists of a reservoir which would impound 4,400,000 acre-feet of water and a power plant of 900,000-kilowatt capacity. There would be resultant benefits to flood control, navigation, and recreation, in addition to power benefits.

The purpose of the current investigation of access roads is to supplement the data previously obtained and furnish a sound base for future studies that will be required in connection with preparation of a definite plan report on this project.

Klamath Project, Oregon and California

PROJECT INVESTIGATIONS

The Klamath project is located on the border line between Oregon and California. The purpose of this investigation is to analyze project repayment arrangements as they are affected by needed changes of irrigation district and individual pumping contracts, the need and alternate means for providing facilities for additional potential development areas, and other factors incident to ultimate development of the project. Some contract readjustments have been made and others are pending. Requests continue to be received for contracts covering additional areas.

A major purpose is to determine the location and extent of such potential irrigable lands and what facility additions or changes are needed to serve areas which can be economically irrigated. Much of this potential area is receiving some water under rental agreements, awaiting the time when a permanent contract and facility can be provided. Analysis of the entire project is necessary in order that equitable repayment arrangements may be established covering current needs and permitting full project development to the extent of available land and water.

Klamath River Basin, Oregon and California

BASIN SURVEYS

The Klamath River Basin is located in northern California and southern Oregon. The major potential agricultural areas are in the upper basin and development of hydroelectric power is possible at a number of places along the main stream and tributaries. The purpose of this investigation is to determine and

inventory the water resources, classify and locate the irrigable lands, and determine the potential agricultural, power, wildlife, and other multiple-purpose utilization of the resources, together with the economic feasibility of the developments. The basic objective is to formulate a basin-wide plan for the conservation and use of the water resources of the Klamath River Basin, which will serve as a framework for the individual features.

McNary Gravity Project, Oregon and Washington

PROJECT INVESTIGATIONS

An investigation is being made to determine areas on both sides of the Columbia River that could be furnished with gravity water from McNary Dam for irrigation or other urban use. McNary Dam is under construction by the Corps of Engineers near Umatilla, Oreg.

Milton-Freewater Project, Oregon and Washington

PROJECT INVESTIGATIONS

The project lands lie along Walla Walla River in Walla Walla County, Wash., and Umatilla County, Oreg., extending from near the twin cities of Milton and Freewater, Oreg., to near the confluence of Walla Walla and Columbia Rivers at Wallula, Wash. Purpose of the investigation is to examine the possibilities of providing supplemental irrigation water to about 12,000 acres and a full supply to about 20,000 acres of new lands. The project is comprised of two divisions. The upper, with about 5,000 acres of presently dry-farmed land, would be served water from a storage reservoir on the river above Milton by gravity diversion or low-lift pumping. Development of the upstream dam site may include power generation facilities. The lower division, with about 27,000 acres, would be served by a pumping plant near Wallula lifting water from the pool behind McNary Dam and a canal extending eastward through the Gardena area. The studies will include consideration of benefits to flood control, fish and wildlife, and recreation.

Molalla Project, Oregon

PROJECT INVESTIGATIONS

Investigation is needed to determine the best source of supply and the best methods for furnishing a full water supply for 40,900 acres of new land.

The project lies in Clackamas and Marion Counties, Oreg., comprising about 40,900 acres of land in need of a full water supply. The project area lies on the floor of the Willamette Valley between the Molalla River in the northeast, the Pudding River on the west and Silver Creek on the south. The lands are somewhat rough and rolling. A few small areas are now watered by gravity diversion and by pumping. About 600 acres of productive lands north of Molalla are now irrigated by the Molalla Irrigation Co. The tentative project plans would call for diversion of the river a few miles upstream and delivery of water along the foothills of the Cascades by a main canal trending in a southwesterly direction to Silver Creek. All of the lands in the project area would be irrigated by gravity. Storage for the project would be obtained on the Molalla River either from the proposed Pelkey Reservoir or an alternate.

Operation and Maintenance Cost and Replacement Analysis, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation is:

1. To obtain a functional break down of costs of operating and maintaining irrigation systems.
2. To obtain a functional breakdown of cost of replacement items.
3. To evaluate the extent to which, and under what conditions, certain physical and organizational factors influence these costs.
4. To provide a basis for setting up a uniform accounting system which will provide more useful information from operating projects, and develop basic information for forecasting operation and maintenance costs under a wide variety of circumstances.

Detailed data on operation, maintenance, and replacement costs are urgently needed to permit more accurate estimates to be made for projects in the planning phase. Also, operating projects urgently need some criteria which can be used to compare current operation and maintenance and replacement costs; a study of the nature outlined herein would enable criteria to be set up based upon firm experience data.

Owyhee Project, Oregon-Idaho

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to provide factual data and analyses prerequisite to development of a fair and equitable plan of repayment for the eight irrigation districts comprising the Owyhee project. The present contracts with these districts would require annual construction payments, beginning in 1950, considerably in excess of the water users ability to pay. Furthermore, the contracts do not provide for varying the annual charges in accordance with variations in crop income and with ability to pay.

Paulina Project, Oregon

PROJECT INVESTIGATIONS

The purpose of the project is to provide irrigation for about 2,200 acres of new land, and furnish supplemental water for about 1,600 acres of land now being inadequately irrigated. The project is located in Crook County, Oreg., some 70 miles east of Prineville, and about 8 miles east of the town of Paulina. The project lands lie in a compact body along Beaver Creek in an area some 2 miles wide and about 7 miles long. The source of water would be from the North Fork of Beaver Creek.

Pendleton Project, Oregon

PROJECT INVESTIGATIONS

The investigation is being made to determine the feasibility of providing a full water supply to new lands near Pendleton in Umatilla County, Oreg., in conjunction with flood control by storage of surplus Umatilla River flows.

Post Project, Oregon

PROJECT INVESTIGATIONS

The Post project, near Post, Oreg., in Crook County, would irrigate 6,500 acres of new land and provide supplemental water for 1,800 acres. The project is made up of four units, two in tributary basins and two on the main river. The water supply would come mainly from headwaters of the North Fork of the Crooked River. About 20,000 acre-feet of water would be stored on this stream in the Big Prairie Reservoir site. Three principal diversion canals will be required. The principal canal will divert from the North Fork and will be about 12 miles in length. It will involve comparatively difficult tunnel construction.

Rogue River Basin, Oregon and California

BASIN SURVEYS

This investigation is to examine means for beneficial use of the waters of the Rogue River Basin in an integrated development for irrigation, recreation, fish and wildlife, power generation, and other uses, and to determine to what extent flood control is possible. The Rogue River Basin is located in the southwestern part of Oregon, and it includes within its boundaries both Jackson and Josephine Counties and a large part of Curry County. Medford, Grants Pass, and Ashland are the main towns. About 64,000 acres of land in the basin are now irrigated, but supplemental water is needed on much of this land. The investigation has shown that an additional 73,540 acres of dry land can be irrigated, and 40,300 acres of land now irrigated can be supplied with needed supplemental water. The waters of the basin are susceptible to control for the reduction of flood damage and to use for generation of hydroelectric power.

Rogue River Basin Project, Oregon and California, Applegate Valley Division

PROJECT INVESTIGATIONS

The purpose of the project is to investigate means for irrigating lands in or adjacent to the Applegate River Valley and possible means of controlling floods of the Applegate River. The rapid expansion of the population of southern Oregon in recent years and depletion of timber resources resulted in a pressing need for expansion of agriculture through additional irrigation. The project irrigation possibilities include supplemental irrigation of 9,500 acres of land now receiving an insufficient supply of water and irrigation of an additional 7,000 acres of dry land. Needed amounts of water could be obtained by storing winter runoff of the Applegate River. Floods could be partially controlled by a multiple-purpose (irrigation and flood control) storage reservoir on the Applegate River. The Applegate Valley project is located in Josephine County, Oreg., in the southern part of the Rogue River Basin.

Rogue River Basin Project, Oregon, Illinois Valley Division

PROJECT INVESTIGATIONS

The purpose of the Illinois Valley investigation is to find means to irrigate a substantial area of dry lands and supply supplemental water to inadequately irrigated lands. Studies show that 5,400 acres could be provided with supplemental supplies and 17,200 acres of dry land could be irrigated. Needed water could be obtained by storing winter runoff of upper tributaries of the Illinois River and Deer Creek in proposed Indian Hill and Kerby Peak Reservoirs. Project lands lie in the vicinity of Selma, Kerby, and Cave Junction in Illinois Valley in Josephine County.

Rogue River Basin Project, Oregon, Medford Division

PROJECT INVESTIGATIONS

This division would provide a supplemental water supply to about 13,200 acres of inadequately irrigated land and a full supply to about 33,300 acres of land presently dry. Flood control and power features are also included in the plans for development.

Project lands are situated in the Rogue River Basin within Jackson and Josephine Counties of southwestern Oregon.

Rogue River Basin Project, Oregon, Merlin Division

PROJECT INVESTIGATIONS

The purpose of the investigation is to determine means of irrigating 8,140 acres of dry land and providing supplemental water to 800 acres of irrigated land. Water would be provided from storage on Grave Creek.

The Merlin project is located in Josephine County, in the north-central part of the Rogue River Basin, Oreg., and comprises for the most part lands adjacent to Jump-Off Joe and Grave Creeks.

Rogue River Basin Project, Oregon, Talent Division

PROJECT INVESTIGATIONS

The purpose of the investigation is to examine possibilities of providing supplemental water to lands now irrigated and, in particular, lands within the existing Talent irrigation district; to determine whether additional dry lands in the vicinity may be irrigated at reasonable cost; and to examine possibilities of giving a measure of control to Bear Creek floods. Present water supply, especially in dry years, is inadequate. All available water in the upper Bear Creek drainage is now used and water is also imported from Keene Creek watershed (Klamath River Basin) and from Applegate River Basin. Studies indicate that water could be obtained for supplemental irrigation of about 10,000 acres of land and a full supply for about 5,000 acres of new land.

Talent division is located in the upper part of Bear Creek Valley in the southern part of the Rogue River basin.

Rogue River Basin Project, Oregon, Union Peak Division

PROJECT INVESTIGATIONS

The purpose of the investigation is to examine the power potential at five sites on the upstream Rogue River located between mile 158 and mile 187. These power installations would be run-of-the-river plants with no storage. Features of each would consist of a diversion dam, canal, penstock, and powerhouse. The installed capacity of the plants would be about 59,550 kilowatts. Deferred development is recommended for the four upstream plants and the investigation at present includes only Cascade Gorge power unit of the Union Peak division.

Snake River Basin, Idaho and Oregon

BASIN SURVEYS

The area to be studied under this investigation is defined as the Snake River drainage basin from the mouth of the Salmon River upstream to Milner Dam, excluding the Powder River drainage area in Oregon. The area will also include all the drainage area lying south of the Salmon River which drains into that stream.

The purpose of this investigation is to study the area as a whole to determine the best use of the available water supply. The area will be studied on a selective basis, choosing the best lands for study and development and with the available water supply in mind. Those areas that are found to require more study will later be set up as separate projects and a detailed study made as to engineering and economic feasibility.

Sprinkler Irrigation, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Purpose of this investigation is to assemble basic information relating to sprinkler irrigation. Studies will include analysis of the effect on yield, the associated costs related to various land types and crops, and water requirements when application is by sprinkler. The study will be carried out within the region. Such information is necessary for the proper selection of irrigation systems and the determination of feasibility of potential projects. The data obtained from this study will aid not only in the project planning phase, but will be usable on existing projects when the water users consider conversion to sprinkler application.

The Dalles Project, Oregon, Eastern Division

PROJECT INVESTIGATIONS

The purpose of this investigation is to provide water to about 6,000 acres of land which lies just south of the Columbia River and east of the town of the Dalles in Wasco County, Oreg. Most of the area is dry, but a few small tracts are included that are inadequately irrigated. Probable sources of water are from Five Mile, Eight Mile and Fifteen Mile Creeks. However, dams would be relatively high for the amount of storage involved.

Tualatin Project, Oregon

PROJECT INVESTIGATIONS

The purpose of this project is to secure a storage-water supply and distribution system for irrigation, to obtain protection from flood damage through storage or by other controls, to obtain a better outlet drainage system for flat bottom lands, and to obtain a dependable municipal water supply for the towns of the area.

The project area, comprising some 68,000 irrigable acres, is located in Washington County, Oreg., in the basin of the Tualatin River, a tributary of the Willamette, and the center of the basin is some 15 miles west of the city limits of Portland.

Umatilla Project, Hermiston and West Extension Districts, Oregon

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to analyze all the factors contributing to the project's ability to repay its obligation to the United States, to devise means of ameliorating the prevalent problems and to complete an amendatory contract with the Government which will be equitable to all concerned. The project's repayment record is unfavorable. Its production and income problems stem largely from basic shortcomings of the physical resources.

Umpqua River Basin, Oreg.

BASIN SURVEYS

The purpose of this investigation is to examine means for beneficially using the waters of the Umpqua River Basin for irrigation, power generation, and other uses, and to determine what flood control is possible.

The Umpqua River drains an area of 4,330 square miles in Douglas County, Oreg., from the summit of the Cascades to the Pacific Ocean, approximately 200 miles south of Portland, Oreg.

United Western Investigation; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand, there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the "united western investigation" is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

Upper Burnt River Project, Oregon

PROJECT INVESTIGATIONS

This project is located between Burnt River and the North Fork of Burnt River near Unity in Baker County, Oreg.

The purpose of this investigation is to determine the practicability of developing a supplemental water supply for 1,400 acres of presently irrigated land. The present inadequate water supply for the area under investigation consists entirely of natural flow diverted from the North Fork of Burnt River above Unity Reservoir.

Vale Project, Oregon

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to determine new and improved methods of maintenance suitable to local conditions, and to determine extent and location of noxious weed infestations as the prerequisite to a weed-control program. A further purpose of this investigation is to reduce to a minimum the damage done to project lands by a rising water table. The current level of the table under all parts of the project which are or may become subject to damage by ground water will be determined and such information will be kept current by periodic measurements in future years. With this information, general recommendations for such protective measures by drainage or otherwise as may be necessary will be prepared. These recommendations will include means of correcting present damage by waterlogging and alkali, as well as for preventing future damage.

Wapinita Project, Oregon

PROJECT INVESTIGATIONS

This project would provide supplemental water to about 2,200 acres of inadequately irrigated land and a full supply to some 21,200 acres of new land. The investigation will involve location of a suitable storage site and a complete investigation. Availability of water supply is contingent upon the subordination of a developed power right on lower White River. The project is located in Wasco County, Oreg., in the vicinity of Wapinita.

Willamette Valley Storage, Utilization Project, Oregon

PROJECT INVESTIGATIONS

The purpose of this investigation is to determine on an interim basis the allocation of cost to irrigation storage in Corps of Engineers flood-control reservoirs in the Willamette Valley, pursuant to provisions contained in the Flood Control Act of 1944 and the Agreement on Principles and Responsibilities, Columbia River Basin, between the Corps of Engineers and the Bureau of Reclamation, dated April 1949, which relates to administration of storage in reservoirs which have been built, are under construction, or are to be built by the Corps of Engineers.

Yamhill Project, Oregon

PROJECT INVESTIGATIONS

The purpose of this investigation is to provide a full supply of water to about 65,800 acres of irrigable land. The project is located in Yamhill County; near McMinnville, Oreg. The lands lying on both sides of the North and South Yamhill Rivers could be irrigated. Drainage would be provided where needed. Water supply for irrigation would come from storage on both the North and South Yamhill Rivers. The reservoirs would serve multiple uses, and could be used during the winter months for needed flood-control storage.

SOUTH DAKOTA

Financial Adjustments, Belle Fourche Project, South Dakota

INVESTIGATIONS OF EXISTING PROJECTS

The Belle Fourche project is located in northwest South Dakota in Butte and Meade Counties, on the Belle Fourche River, a tributary of the Cheyenne River.

The purpose of this investigation is to analyze and increase, if possible, the income potential of the project, particularly in relation to the new amendatory repayment contract.

Water Conservation Studies, Belle Fourche Project, South Dakota

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to determine, in collaboration with South Dakota College and Experiment Station, ways and means of increasing the income from farms which have gone to the county for taxes and now have been returned to private ownership and carrying on economic surveys to determine the most practicable and profitable types and methods of farming.

TEXAS

Balmorhea Project, Texas

PROJECT INVESTIGATIONS

The project area is located in Reeves County, Tex., in the basin of Toyah Creek, a tributary of the Pecos River. The project lands comprise 10,400 acres of land along Toyah Creek in the vicinity of Balmorhea, including 7,140 acres in and adjoining the Reeves County water improvement district No. 1, which are now irrigated but inadequately supplied, and 3,260 acres of new lands adjoining the district.

The presently irrigated area is supplied principally from the flow of three artesian springs, supplemented by occasional flood flows of Madera Creek, which

together with surplus spring flows are diverted into Lower Parks Reservoir. This reservoir, the diversion canal from Madera Creek, and the canals and laterals leading from the springs and the reservoir to the project lands constitute the existing works.

The purpose of this investigation is to determine the possibilities of providing an adequate water supply to the area now inadequately supplied and to the 3,260 acres of new lands through further conservation and utilization of available waters. This would be accomplished mainly by increasing the capacity of Lower Parks Reservoir from 5,200 to 20,300 acre-feet, the construction of a new outlet canal from the reservoir, and the rehabilitation of the district's distribution system. The plan also provides for the purchase of Phantom Lake Springs and construction of new concrete-lined canals to deliver the flow of these springs to the district's canals and reservoir; and the President, under authority of the act of August 11, 1939 (53 Stat. 1413), on April 15, 1944, authorized the Bureau of Reclamation to carry out these features of the plan. These features have now been completed and are in operation.

Canadian River Project, Texas

ADVANCE PLANNING

The potential Canadian River project consists of a multiple-purpose reservoir on the Canadian River and an aqueduct system for delivering surface water therefrom to cities in the High Plains region of northwest Texas to supplement municipal and industrial water supplies. Provision of surface water to the cities would minimize ground water withdrawals, thereby making available more ground water for irrigation use in the region. The reservoir would result in flood control, possible power development of as much as 80,000 kilowatt, fish and wildlife conservation, and recreational benefits of substantial magnitude, and additional sediment control and national defense benefits are likely to result from its construction.

The purpose of these investigations is to perform such preconstruction work as will permit the earliest possible initiation of construction.

Canadian River Project, Texas

PROJECT INVESTIGATIONS

This investigation covers a part of the High Plains of Texas, including the area between the Canadian River and the town of Lamesa.

The purpose of the investigation is to develop a plan to meet the surface-water requirements of 11 north Texas cities and to provide an adequate supply of water of acceptable quality to the interested municipalities. The project is designed to serve the long-range demands of the cities of Borger, Amarillo, Pampa, Plainview, Lubbock, Tahoka, O'Donald, Lamesa, Littlefield, Slaton, and Levelland. In addition to the primary function of supplying water for municipal and industrial use, the project will include all feasible secondary uses of project works for flood control, power, fish and wildlife, recreation, and irrigation.

The principal features of the project consist of a storage reservoir on the Canadian River near Borger, with aqueducts to the interested cities and pumping plants along the aqueducts. Preliminary studies indicate that as much as 80,000 kilowatts of peaking power could be developed through pump-storage facilities, actual development to depend upon peaking needs in the area.

General Power Studies, Colorado, Kansas, New Mexico, Oklahoma, and Texas

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program to provide maximum utilization of power resources. The studies include consideration and study of firming power sources such as coal-fired gas turbines; system planning through use of network analyzers; studies of transmission interconnections with other regions and utility systems; consideration of regional transmission requirements; coordination of plants and systems; and preparation and interchange of technical data incidental to the plans of the Federal Power Commission, other Federal agencies, and State agencies. Annual revision of the region five-power program as set forth in the Bureau's advance power program to reflect latest plans is also included.

Gulf Basin, Tex.

BASIN SURVEYS

This investigation covers the portion of Texas lying within the basins of streams entering the Gulf of Mexico, exclusive of the Rio Grande Basin. It includes the investigations formerly listed for the Sabine-Neches, Trinity, Brazos, Colorado, Guadalupe, and Nueces River Basins.

The purpose of this investigation is development of a plan of water control and utilization for the entire basin which will provide for the projects needed to assure the most economic and satisfactory solution to the water problems of the basin. These problems include the necessity of providing adequate municipal and industrial water supplies to the cities and towns of the region, development of irrigation where feasible with surplus waters not required for municipal and industrial water supply, flood control, hydroelectric power development, and surface drainage improvement to eliminate agricultural and other damages in the Gulf coastal area resulting from the inadequacy of present drainage facilities. The immediate objective of the investigation is to complete an inventory of potential water demands by uses and locations and the supply available to meet such demands with projects existing, under construction, authorized, and which may be authorized. This inventory is expected to serve as a basis for a State-sponsored water-use plan which would recognize the needs of all areas and interests concerned and provide for assignment of stream flows to fit those needs, as a preliminary to development of a plan for regulating and delivering the water supplies to accomplish these objectives.

IBWC (Falcon) Project, Texas

PROJECT INVESTIGATIONS

The International Boundary and Water Commission is beginning construction of the Lower International Dam on the Rio Grande between Texas and Mexico. The dam is located near the town of Falcon, Tex., downstream from Laredo, Tex., and upstream from McAllen, Tex. The Chief Engineer's office of the Bureau of Reclamation is designing the power plants for the IBWC which will be installed for operation by the IBWC for each nation.

Legislation is pending before Congress which will designate the Bureau of Reclamation of the Department of the Interior as the marketing agent for power to be generated from the United States hydroelectric plant at Falcon Dam. In connection with the marketing of power by the Bureau of Reclamation, it will be necessary to make additional market surveys in the lower valley to determine the extent of existing power supply and the additional power requirements in the area. It will also be necessary to plan the transmission lines and substations for delivering the power generated at Falcon to load centers and customers of the Bureau, including REA cooperatives desiring service.

Lower Nueces River Project, Texas

PROJECT INVESTIGATIONS

The project area is located in the lower basin of the Nueces River in southern Texas. Its primary purpose will be provision of an assured water supply on a long-term basis to the rapidly expanding municipal and industrial area centering around Corpus Christi, Tex. Multiple-purpose features, including irrigation development, power, flood control, sediment control, recreational development, and fish and wildlife conservation will be incorporated in the project to the extent they are found to be feasible and consistent with the primary purpose of municipal and industrial water supply.

Existing works of the city of Corpus Christi consist of a storage dam on the Nueces River near Mathis, Tex., a diversion dam on that river near Calallen, Tex., and an aqueduct from the diversion dam to the city. The capacity of the storage reservoir has been materially reduced by sedimentation and is now inadequate to supply present needs of Corpus Christi should a critical period of low stream flow, such as was experienced in 1916–18, occur. The local interests are aware of this situation and strongly desire the development of additional supplies

Studies of the Nueces River Basin summarized in Project Planning Report No. 5–14.04–3, dated February 1946, revealed several potential irrigation projects in the upper basin which would be desirable to provide for optimum utilization of the available land and water resources though found infeasible under repayment

requirements of the reclamation laws. In addition it is recognized that hydroelectric power could be developed in connection with other basin developments.

The purpose of the investigation is to develop a plan for supplying the municipal and industrial demands of the Corpus Christi coastal area.

Nueces River Power Development

PROJECT INVESTIGATIONS

This investigation will include an outline of the facilities required for development of power at the Oakville Dam site on the Nueces River below Three Rivers, Tex., and the power potentialities of the basin. The primary purpose of the Oakville Reservoir would be to provide municipal and industrial water for the city of Corpus Christi, Tex. Utilization of the reservoir for power development would be included if practicable.

The purpose of the investigation is to determine the feasibility of developing hydroelectric power to supplement power from interconnected fuel-electric and other hydro plants in the area.

Pecos River Basin, N. Mex. and Tex.

BASIN SURVEYS

The Pecos River rises in the western portion of Mora County in New Mexico and flows southerly to enter the Rio Grande in Valverde County, Tex. The basin contains many irrigation projects in both New Mexico and Texas, some of which have water rights dated back several hundred years. The vested rights on the stream exceed the available flows, and water shortages are suffered generally throughout the basin. Several investigations and reports on its water problems have been made by appropriate Federal, State, and private interests. An interstate compact to provide for the division of Pecos River waters was recently negotiated and approved by New Mexico, Texas, and the United States. Investigations in the basin are being directed toward formulation of a comprehensive basin plan which will provide for the optimum utilization of the water and land resources and power potential of the basin within the provisions of the Pecos River compact.

Rio Grande Project, New Mexico and Texas

INVESTIGATION OF EXISTING PROJECT

The Rio Grande project located in New Mexico and Texas, consists of approximately 155,000 acres of irrigable land. During the past 2 years an investigation has been under way to develop plans, programs, and cost estimates for the rehabilitation of the project works. It is now proposed to extend the investigation to include field surveys, economic studies, and preconstruction designs for the improvement of community ditch facilities located within the El Paso County Water Improvement District No. 1. These areas are immediately adjacent to the city of El Paso, both above and below, and are becoming highly developed and congested. It is estimated at the present time that within the area between El Paso and Ysleta there are approximately 15,000 to 18,000 people in residence while in the area known as the country club district immediately above El Paso it is estimated between 3,000 and 4,000 are in residence. The Bureau maintains the water-delivery point from the main canal and laterals the same as was the case when these areas were in farms; the rapid growth and the change from farm units to small-home units have created a condition approaching chaos with respect to an efficient system of water delivery and maintenance of ditches by the individual water users. The people who own property in these community ditch areas are all members of the El Paso County Water Improvement District No. 1 and pay all the annual assessments for operation and maintenance, construction, and reservoir service charges, the same as any average water user; however, they do not obtain the same type of service that is given to the average farmer. Recognition of this condition indicates the necessity for an investigation which will lead to a solution of a very unsatisfactory problem now existing on the community ditches.

The residents in these areas have not been able to operate effectively their community ditch systems, nor to maintain them properly with the result that frequent flooding of property, court actions, etc., are becoming more and more numerous each year. In order to overcome these conditions now existing among the mem-

bers of the El Paso County Water Improvement District No. 1, the investigation is proposed to determine ditch systems that will, in effect, be self-cleaning and which may be regulated more efficiently than under the present haphazard manner of service.

West Texas Project, Texas

PROJECT INVESTIGATIONS

This investigation covers the basins of the Brazos River above Possum Kingdom Reservoir, the Colorado River above the mouth of Pecan Bayou, and the upper Leon Riber Basin, and includes further consideration of the Robert Lee, San Angelo, and Seymour projects. Throughout the region under consideration, ground water of usable quality is seldom found in quantities sufficient to support substantial municipal, industrial, and irrigation development. Consequently, nearly all of the cities and towns of the region depend upon surface-water sources for their water supplies. Irrigation development is negligible except in the vicinity of Brownwood, from Lake Brownwood, and in the upper Concho River, using the flow of springs. Present water supplies are generally either inadequate to meet present requirements of the cities and towns or will become inadequate in the foreseeable future as municipal and industrial expansion continues.

The purpose of this investigation is to evolve a plan for controlling and utilizing the water resources of the upper Colorado and Brazos River Basins, to assure adequate water supplies to the municipalities of the region on a long-term basis, and to develop irrigation with flows not needed for municipal and industrial use. Such a plan would provide flood control, power development, sediment control, recreational development, and fish and wildlife conservation where found to be feasible and desirable.

The project would involve reservoirs on the major streams of the region required to provide a regulated supply of adequate quantity and usable quality to meet the region's needs; aqueduct systems to deliver water to the municipalities; irrigation distribution systems to deliver water to the project lands; and hydroelectric power facilities where feasible. Preliminary studies indicate that power potential could best be utilized for peaking purposes; that capacity would be dependent upon the peaking needs of utilities in the area and that as much as 50,000 kilowatts could be developed if pump storage installations should be included. The project would be comprised of six divisions as follows:

Robert Lee division (*Robert Lee project*).—Municipal and industrial water supply for Odessa, Midland, Big Spring, and Snyder, Tex.; irrigation of lands between the Colorado and Concho Rivers near Ballenger, Tex.

Seymour division (*Seymour project*).—Irrigation of lands along the Double Mountain Fork of the Brazos River near Seymour, Tex.

Stamford division.—Municipal and industrial water supplies for cities in the upper Brazos River Basin from a potential reservoir on California Creek.

San Angelo division (*San Angelo project*).—Irrigation of lands along the Concho River near San Angelo, Tex., with water stored in San Angelo Reservoir now under construction by the Corps of Engineers.

Eastland division.—Municipal and industrial water supplies for cities in and adjacent to the upper Leon River Basin from a potential reservoir on Colony Creek.

Brownwood division (*Brownwood project*).—Municipal and industrial water supply to the city of Brownwood, Tex., and irrigation of lands below Lake Brownwood.

West Texas Project, Brownwood Division

PROJECT INVESTIGATIONS

The project area is located in Brown County, Tex., in the basin of Pecan Bayou, a tributary of the Colorado River (Texas). The project lands lie along both sides of Pecan Bayou both above and below the city of Brownwood and include 6,400 acres within the boundaries of Brown County Water Improvement District No. 1.

Existing works are owned by the district and comprise Lake Brownwood Dam and Reservoir and distribution system for delivering an irrigation supply to district lands and municipal supply to the city of Brownwood. The Corps of Engineers has been authorized by the Congress to raise the present dam to provide flood-control storage, but now plans to build a new dam a short distance downstream from the present structure. No increase in conservation storage capacity is contemplated by the Corps of Engineers.

A considerably larger acreage than can be served by the district's distribution system could be supplied from the present conservation storage through the construction of an additional main canal and laterals. Preliminary studies indicate that this storage is sufficient to provide an adequate water supply to the city of Brownwood and irrigate at least 16,000 acres.

The purpose of this investigation is to determine the area of new lands that could be supplied with irrigation water and to complete a feasibility report setting forth a plan for such development and evaluating the economic feasibility thereof.

UTAH

Bear River Project, Utah and Idaho

PROJECT INVESTIGATIONS

The project area is located in Franklin and Oneida Counties, Idaho, and Cache and Box Elder Counties, Utah, in the Bear River Basin. Land areas to be served are centered near Preston, Idaho; Richmond, Utah; Plymouth, Utah; Samaria, Idaho; Trementon and Snowville, Utah.

The investigation of the Bear River project has as its object the development of a plan for the fullest practicable control and use of the Bear River water for multipurposes, including irrigation, power, flood control, recreation, and fish and wildlife propagation. Although Bear River at present is extensively developed for irrigation, power, and other uses, greater and more efficient use of its water could be accomplished through additional storage control and by altering or decreasing downstream uses of water for power.

The project is comprised of two principal divisions, namely: The Cache division involving approximately 12,000 acres of new land and 48,000 acres of land inadequately irrigated, and the Oneida Division with approximately 112,000 acres of new land and 42,000 acres of land inadequately irrigated. The total land acreage under the project is 124,000 acres of new land and 90,000 acres requiring a supplemental supply.

Cache Division, Bear River Project, Utah and Idaho

PROJECT INVESTIGATIONS

The project area is located in Franklin County, Idaho, and Cache County, Utah, in the Bear River Basin. Land areas to be served are centered near Preston, Idaho, and Richmond, Utah.

Purpose of the project is to improve the water supply for terrace lands lying east of Bear River. Storage will be obtained on tributary streams of Bear River by construction of Mapleton Reservoir and enlargement of the existing Glendale Reservoir. The project would provide water for the supplemental irrigation of 48,000 acres of land now inadequately irrigated and development of 12,000 acres of new land.

Central Utah Project, Utah

PROJECT INVESTIGATIONS

The project area is located in the eastern part of the Bonneville Basin in central Utah and in the Uinta Basin, a part of the Colorado River Basin in northeastern Utah. It includes the communities of Vernal, Roosevelt, Salt Lake City, Provo, Spanish Fork, Nephi, and Fillmore.

The purpose of this investigation is to appraise the possibilities of intercepting streams descending the south slope of the Uinta Mountains and conveying water by gravity flow to the Strawberry Reservoir for subsequent release to Bonneville Basin for irrigation, municipal, and industrial uses. Also to be determined are the possibilities of providing replacement water for the Uinta Basin lands making additional developments in the Uinta Basin by a major diversion from Green River and by other developments on local streams.

The project would benefit about 464,000 acres of land. Approximately 196,000 of these would receive a full irrigation supply. The remaining acreage would receive supplemental water or better seasonal regulation of present supplies. Municipal and industrial needs would be supplied. En route to places of use the water would be utilized for the production of hydroelectric power.

Colorado River Storage Project, Colorado, New Mexico, Utah, and Wyoming

PROJECT INVESTIGATIONS

The project area includes upper Colorado River Basin lands and adjacent lands in the States of Colorado, New Mexico, Utah, and Wyoming. To permit these States to beneficially consume their share of Colorado River water as apportioned by the 1922 Santa Fe compact and fulfill their obligations for downstream delivery as further specified therein, reservoir storage must be provided for hold-over of surplus flows during periods of high runoff to supplement reduced river flows at Lee Ferry in low runoff periods.

The purpose of this investigation is to determine a system of reservoirs that will yield the maximum water supply for irrigation by confining reservoir storage losses to an economic minimum, and simultaneously accomplish all other possible purposes of multiple-purpose operation, including river regulation, power development, recreation, fish and wildlife conservation, and sediment retention.

Colorado River Storage Project, Echo Park Unit, Colorado and Utah

PROJECT INVESTIGATIONS

This is the key storage unit on the Green River for the upper basin storage system. Located in Colorado just 3 miles downstream from the Yampa River confluence, a high dam at this site has excellent storage and power possibilities. In addition to its strategic location for regulating the flows of these two major streams, this site enjoys advantages attendant to upstream location, such as low evaporation loss, regulation for downstream power plants, and channel water loss salvage resulting from reductions in flood flow.

Colorado River Storage Project, Flaming Gorge Unit, Utah and Wyoming

PROJECT INVESTIGATIONS

As a unit of the Colorado River storage project, this dam and reservoir would provide nearly 3 million acre-feet of active storage capacity for river regulation. The dam site is located in Red Canyon near the Utah-Wyoming State line and the dam would be the farthest upstream unit of the project on Green River. Extensive investigations of possible power sites in this section of the river have been conducted by both public and private agencies for 30 years. Recently the added feature of a possible gravity irrigation diversion from this site to replace the potential central Utah project diversion of Uinta Basin waters into Bonneville Basin has made attractive the present Ashley dam site, which is downstream from other sites previously contemplated. Replacement water thus diverted to Uinta Basin would assure a full regulated water supply to approximately 170,000 acres of land now irrigated and would also serve 77,000 acres of new land.

Colorado River Storage Project, Glen Canyon Unit, Arizona, and Utah

PROJECT INVESTIGATIONS

Glen Canyon dam site, located on the Colorado River 15 miles upstream from Lees Ferry, Ariz., is the final regulatory control point in the upper Colorado River Basin. Without regulation on lower San Juan River or on the Colorado River proper above Green River confluence, storage must be provided not only for the large unregulated flows of these two branches of the system, but also for Green River inflows below the proposed Gray Canyon Reservoir. Present critical power needs in both the upper and lower basins of the Colorado River assure a ready market for its large potential production. Recreation benefits will accrue with access road to the dam and reservoir. Other potential benefits include flood control, fish and wildlife conservation, and regulation and sediment storage for existing and potential downstream developments.

Colorado River Storage Project, Gray Canyon Unit, Utah

PROJECT INVESTIGATIONS

Located on the Green River about 4 miles upstream from the Price River confluence, a dam at Gray Canyon site would take advantage of the regulated releases from Echo Park Reservoir for power production. As a unit of the

Colorado River storage project it would assist in regulating the inflows from the Duchesne and White Rivers and other tributary streams below the Split Mountain dam site. Investigation of this unit is required to determine reservoir capacity, power-plant capacity, and economic feasibility.

Colorado River Storage Project, Split Mountain Unit, Utah

PROJECT INVESTIGATIONS

The Green River falls about 250 feet through Split Mountain Canyon to the Split Mountain dam site located approximately 15 miles downstream from the Echo Park Site. With stream-flow regulation provided by a large-capacity reservoir upstream, utilization of the head for power development would be attractive. To reregulate the releases from Echo Park power plant, a reservoir would be created at the Split Mountain site with a maximum water surface limited to the tailwater elevation of the Echo Park plant. An additional 50 feet of power head may be utilized by construction of a 2-mile tunnel extending downstream from the Split Mountain Dam.

Columbia River Basin, Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Nevada

BASIN SURVEYS

The Columbia River drains a watershed of 259,000 square miles in the Pacific Northwest. It has been called the heartland of the Northwest. A plan for comprehensive development of the basin's water resources has been prepared by the Bureau of Reclamation for the Department of the Interior. A second similar plan has been prepared by the Corps of Engineers of the Department of the Army. These two plans have been coordinated by agreement between the two departments. (Interior's report is H. Doc. 473, 81st Cong.)

The Bureau of Reclamation has a number of responsibilities for continuing investigations related to the plan for comprehensive development of the Columbia River Basin. These responsibilities stem from recommendations in the departmental report, from the agreement between the Interior and Army Departments, and from actions of interagency committees in the Pacific Northwest who are concerned, in part, with development of the Columbia River Basin.

Dixie Project, Utah

PROJECT INVESTIGATIONS

The Dixie project contemplates storage of surplus flows of the Virgin River in a 246,000 acre-foot capacity potential reservoir at Virgin City and the storage of surplus flows of the Santa Clara River in a 24,000 acre-foot potential reservoir at the lower Gunlock site. A supplemental supply of water would be furnished to 7,470 acres of irrigated land, and to 11,030 acres of new lands from the Virgin City Reservoir; a supplemental supply would be furnished to 1,565 acres of irrigated land and to 2,585 acres of new land from the lower Gunlock Reservoir. The irrigated areas lie in the general vicinity of St. George, Utah. The part of the project supplied by the Virgin River (the Hurricane division) would have three power plants with 13,275 kilowatt aggregate installed capacity.

Dolores Project, Colorado and Utah

PROJECT INVESTIGATIONS

The project area is located in Dolores and Montezuma Counties, in southwestern Colorado, and in San Juan County, Utah. It is in the basin of the Dolores River, a tributary of the upper Colorado River.

The purpose of this investigation is to determine the possibilities for a storage water supply to irrigate some 40,000 acres of arable land in the Dove Creek area of southwestern Colorado. The plan contemplates construction of a storage dam at the McPhee site on the Dolores River about 10 miles below Dolores, Colo.

Emery County Project, Utah

PROJECT INVESTIGATIONS

The potential Emery County project is located in the upper Colorado River Basin on the eastern slope of the Wasatch Mountains in the vicinity of Huntington, Castle Dale, and Orangeville in central Utah.

Purpose of the project is to develop a supplemental water supply for irrigation of 20,500 acres now inadequately irrigated and a full supply for irrigation of 3,600 acres of new land. The project would involve construction of Joes Valley Dam on Cottonwood Creek-Huntington Canal to divert part of the storage water to the Huntington Creek area.

General Power Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to formulate a regional plan and program for the maximum economic development and utilization of hydroelectric resources of the area. In order to achieve this purpose it is necessary to unify on a region-wide basis the power planning for the various projects, both authorized and proposed, so that the power features of each project will be developed as an integral part of the entire regional system, coordinated with the plans and efforts of other power-producing agencies in the Southwest.

These studies involve system and intersystem planning, power site and capacity investigations, determination of transmission-system requirements, coordination of plants and systems, and collection and analysis of power-market data, as well as the preparation and interchange of technical information incidental to the plans of Federal and State agencies and utilities in region 3.

Glen Canyon Unit, Colorado River Storage Project, Utah, Arizona

PROJECT INVESTIGATIONS

The Bureau has foreseen for many years the strategic importance of a reservoir at the downstream end of the upper Colorado River Basin. Such a reservoir would serve as a means for the upper basin to fulfill its obligations under the Colorado River compact. A dam in Glen Canyon, 15.3 miles upstream from Lees Ferry, Ariz., would create such a reservoir, and in addition furnish one of the outstanding power possibilities on the Colorado River; it would in addition store sediment which would otherwise greatly shorten the useful life of the potential Marble Canyon and Bridge Canyon power reservoirs.

Gooseberry Project, Utah

PROJECT INVESTIGATION

The potential Gooseberry project, a transmountain diversion project to bring water from the Colorado River Basin into the Bonneville Basin, would provide a partial, supplemental water supply for 21,800 acres of land now inadequately irrigated in Sanpete Valley in Central Utah, about 100 miles south of Salt Lake City. Although some 60,000 acres are now irrigated, the valley has less than half the irrigation water necessary for full crop production on these lands. Recent construction of the Scofield project in the neighboring Price River Basin, a subbasin of the upper Colorado River drainage, makes available some surplus waters of Price River which could be used on Sanpete Valley lands. The Gooseberry project is designed to utilize these surplus flows of Price River and in addition some surplus flows from the headwaters of San Rafael River, also in the upper Colorado River drainage. Irrigation is the primary purpose of the project.

Lower Colorado River Basin, Arizona, California, Nevada, New Mexico, and Utah

BASIN SURVEYS

The Bureau is undertaking, as time permits, a comprehensive study of the water supply of the Lower Colorado River Basin to parallel a similar study already made for the upper basin and embodied in the report, Final Report, Engineering Advisory Committee to Upper Colorado River Basin Compact Commission, November 28, 1950. The data developed for the lower basin will be basic for general planning purposes involving water resources; it will furnish a factual basis for examination of issues arising from the Colorado River Compact and should be helpful in resolving controversial points.

Oneida Division, Bear River Project, Utah and Idaho

PROJECT INVESTIGATIONS

The potential Oneida division is located in Franklin and Oneida Counties, Idaho, and Cache and Box Elder Counties, Utah, in the basin of the Bear River. Land areas to be served are centered near Preston and Samaria, Idaho; and Plymouth, Tremonton, and Snowville, Utah.

Purpose of the investigation is the development of a plan for greater utilization of Bear River water for irrigation, power, flood control, recreation, and fish and wildlife protection. By means of the reservoir development at Bear Lake, waters of Bear River originating above Bear Lake are completely regulated for irrigation and power production. Additional storage facilities are needed, however, below Bear Lake to provide an enlarged supply for supplemental irrigation and to develop new land for irrigation.

The plan involves new storage development at the Thatcher site on Bear River, at the offstream Sage Valley and by the enlargement of the existing Cutler Reservoir on Bear River. The project would serve approximately 112,000 acres of new land and 42,000 acres of land inadequately irrigated. An installed capacity of 750 kilowatts would be used for power production at the Sage Valley Reservoir site.

Financial Adjustments, Sanpete Project, Ephraim Division, Utah

INVESTIGATION OF EXISTING PROJECTS

The Ephraim division of the Sanpete project is located in Sanpete County in central Utah. The Ephraim division provides a supplemental water supply to 7,000 acres of land in the vicinity of the town of Ephraim by direct diversion of about 4,400 acre-feet of water annually through the Ephraim tunnel from the San Rafael River, a Colorado River tributary.

The Ephraim division is one of the low-income projects of region 4, notwithstanding present high prices of farm products. The purpose of this investigation is to determine the repayment capacity of the water users and whether an amendatory repayment contract would be advisable to better enable the water users to meet construction charge installments. A water supply and use study will be made as part of the economic study.

Financial Adjustments, Sanpete Project, Spring City Division, Utah

INVESTIGATION OF EXISTING PROJECTS

The Spring City division of the Sanpete project is located in Sanpete County in Central Utah. The project works provide supplemental water to 6,000 acres of land near the town of Spring City by direct diversion of about 4,300 acre-feet of water annually from the San Rafael River, a Colorado River tributary.

The Spring City division is one of the low-income projects of region 4, notwithstanding present high prices of farm products. The purpose of this investigation is to determine the repayment capacity of the water users, leading to an amendatory repayment contract to better enable the water users to meet construction-charge installments. A water supply and use study will be made as part of the economic study.

Sedimentation Studies, Including Quality of Water Studies, Arizona California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

Since the Colorado River and its tributaries carry unusually large quantities of silt, it becomes necessary to determine these quantities adequately for design purposes in order that Bureau reservoirs may have ample capacity, silt considered, and to estimate the probable useful life of reservoirs, both constructed and prospective. Future reservoirs such as Glen Canyon, Marble Canyon, Coconino, Bridge Canyon, and reservoirs on the Dixie project must all be designed with large allowances in capacity for silt retention. The Geological Survey has been carrying on a cooperative program of silt sampling on the Colorado River at Lees Ferry, Ariz., the Little Colorado River at Cameron, Ariz., and the Virgin River at Littlefield, Ariz. Quality-of-water determinations are also made as an incident of this work.

Storm Studies, Arizona, California, Nevada, New Mexico, and Utah

GENERAL ENGINEERING AND RESEARCH

For determination of size of spillways, and freeboard of dams, and allowances to make for flood heights and flood damages, the engineer depends upon the results of storm analyses. The Bureau of Reclamation has an agreement with the Army at Commissioner level to divide up the field of storm studies so that no duplication will result and so that each agency will have the results of the other's work. The regional office carries on such studies in Boulder City.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under condition of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

Weber Basin Project, Utah

ADVANCE PLANNING

The Weber Basin project is located in north-central Utah and comprises all of Davis, Weber, and Morgan Counties, most of Summit County, and a small part of Box Elder County. About one-fifth of Utah's population lives within this area. Ogden, the second largest city in Utah, is located near the center of the project. Salt Lake City, the capital and largest city of Utah, is situated just south of the project area. The project was authorized by Public Law 273, Eighty-first Congress, first session, dated August 29, 1949.

The purpose of this project is to develop the basin's remaining surplus supply of water for irrigation and municipal needs, to provide needed drainage outlets for the water-logged lands, to protect lands and improvements from flood damage, and through the water-resource development to increase recreational opportunities and improve fish and wildlife values of the area.

A total of 100,000 acres of agricultural land will be directly benefited by the project. About 70,000 acres of potentially productive land now unirrigated and 30,000 acres now only partially supplied will receive irrigation water. Approximately 39,000 acres of water-logged lands will be reclaimed by drainage and protected from further seepage. More than 40,000 acre-feet of water will be made available to some 25 municipalities in Davis and Weber Counties.

In approving the bill authorizing the project, the President of the United States directed that detailed information on the allocation and repayment of the project costs be secured and that the Department of Agriculture and Corps of Engineers be consulted on matters involving these problems. The Bureau of Reclamation is preparing a definite plan report in order that proper allocation of costs may be made and to provide a substantiating basis for initiation of construction.

The immediate goal is to complete a definite plan report by December 1951 so that construction contracts for the first storage and conveyance facilities can be awarded as early thereafter as construction funds are available. The first features of the project should be completed as rapidly as possible to provide the urgently needed water for several towns and cities experiencing critical shortages.

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WASHINGTON

Agricultural Surpluses and Land Development, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Since the end of World War II, the general question of agricultural surpluses has been given increasing attention. Some individuals have criticized the reclamation program on the ground that it merely contributes to those surpluses. The purpose of this investigation is to make a careful appraisal of both the short- and long-run effects of land development upon agricultural surpluses. The study will cover both the theoretical and historical aspects of the problem. It will include consideration of all land development in the Nation with special emphasis upon irrigation in the Western States. It will also include a consideration of the dynamics of land development and the related effect upon population, income, and demand for agricultural products.

Clark Fork Basin, Montana, Idaho, and Washington

BASIN SURVEYS

The purpose of this investigation is to prepare a basin-wide report outlining ultimate plans of development in the Clark Fork Basin, and to present individual projects for authorization and further investigation. The basin lies in western Montana, northern Idaho, and eastern Washington.

The area of the basin upstream from Lake Pend Oreille of northern Idaho is assigned to the Bureau of Reclamation for investigation and development of multiple-purpose projects under the Bureau-Corps of Engineers' agreement of April 11, 1949, on the Columbia River Basin. Development of irrigation projects throughout the basin, moreover, remains a Bureau function. One of the purposes of the investigation will be to fit the plans for reservoirs in the area made by the Corps of Engineers into the over-all plan for development of the basin.

Columbia River Basin, Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Nevada

BASIN SURVEYS

The Columbia River drains a watershed of 259,000 square miles in the Pacific Northwest. It has been called the heart-land of the Northwest. A plan for comprehensive development of the basin's water resources has been prepared by the Bureau of Reclamation for the Department of the Interior. A second similar plan has been prepared by the Corps of Engineers of the Department of the Army. These two plans have been coordinated by agreement between the two departments. (Interior's report is H. Doc. 473, 81st Cong.)

The Bureau of Reclamation has a number of responsibilities for continuing investigations related to the plan for comprehensive development of the Columbia River Basin. These responsibilities stem from recommendations in the departmental report, from the agreement between the Interior and Army Departments, and from actions of interagency committees in the Pacific Northwest who are concerned, in part, with development of the Columbia River Basin.

Cooperative Fruit Study, Washington

GENERAL ENGINEERING AND RESEARCH

Purpose of this investigation is to establish the relationship of land type to the yield and production requirements for various kinds of fruit grown in the State of Washington. This information is essential to determinations of feasibility of various projects in the State now under study and planned for future investigation; and will be of value for planning projects in other States. Furthermore, the information will be usable on existing projects where fruit is a crop or is so contemplated.

Dayton Project, Washington

PROJECT INVESTIGATIONS

Lands of the Dayton project lie in a 70-mile-long strip extending from the vicinity of Dayton, Columbia County, along Touchet River to its junction with Walla Walla River at Touchet, Walla Walla County, about 20 miles west of

Walla Walla, Wash. The purpose of the investigation is to determine the possibilities for storage developments to provide irrigation water supplies and flood control. The project area is comprised of upper and lower divisions. The upper division involves storage on the East Fork above Dayton to provide supplemental water for irrigated lands and a full supply for new lands between Dayton and Lamar; the lower division involves storage in the canyon section below Lamar to provide supplemental and full supplies for irrigated and new lands near the mouth of Touchet River. The developments would serve about 8,000 acres of inadequately watered land and about 6,000 acres of new land. No hydroelectric generation is contemplated.

Excess Land Survey, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation, which is region-wide, is to gather and analyze all data relating to compliance with the acreage limitations of reclamation law and to bring all violations into compliance with the law and with the irrigation districts' contracts with the United States. A periodical inventory of this nature is necessary because of the constantly changing pattern of land holdings.

Foster Creek Project, Washington

PROJECT INVESTIGATIONS

The project is located in Douglas and Okanogan Counties in north central Washington. The lands lie in a relatively compact area at the confluence of Okanogan and Columbia Rivers near Bridgeport and Brewster. Chief Joseph Dam, originally named Foster Creek Dam because of its location near the mouth of that stream, is being constructed by the Corps of Engineers on Columbia River some 12 miles upstream from the mouth of the Okanogan. The investigation will examine possibilities for providing full or supplemental water supplies for up to 10,000 acres of new and inadequately irrigated land through gravity canals from Chief Joseph pool or by pumping from the pool.

General Power Studies, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program which would enable maximum economic development and utilization of power and water resources of the area. Full development of the region's power plan will require technical studies for (1) the planning of a program for development of power resources and power systems or parts thereof; (2) the marketing and sale of power, and (3) the establishment of rate schedules.

These power studies involve power plant, system and intersystem planning, as well as power site and capacity determinations, transmission requirements, coordination of plants and systems, technical studies for the development of power resources, the marketing and sale of power, the establishment of rate schedules, average rate and repayment studies covering existing and proposed projects and estimated financial operation until complete return of costs borne by power are effected, and preparation and interchange of technical data incidental to the plans of other agencies. Such agencies include Corps of Engineers, Bonneville Power Administration, public and privately owned utilities, State power administrations, Federal Power Commission, and other State and Federal agencies.

Greater Wenatchee Project, Washington

PROJECT INVESTIGATIONS

The project lands are located in Chelan and Douglas Counties in central Washington near the city of Wenatchee and the confluence of Wenatchee and Columbia Rivers. The project is comprised of five areas; namely, Moses Coulee with 2,000 irrigable acres, East Bank with 2,500 acres, West Bank with 3,500 acres, Malaga to Crescent Bar with 800 acres, and Eastern Division with 4,900 acres. The investigation will determine the possibilities of obtaining storage in Lake Wenatchee and distributing water to these areas through canals, and of alternatives of pumping to each area from Columbia River with lifts ranging from 400 to 800 feet. The studies will include consideration of power generation and fish and wildlife benefits.

Hartline Project, Washington

RECONNAISSANCE

The Hartline project lies between Coulee City and Hartline in northern Grant County, Wash., about 25 miles south of Grand Coulee Dam. Coulee City and the equalizing reservoir now being constructed in Grand Coulee adjoin the western boundary of the project lands in question. The project would provide for the irrigation of 13,450 acres of potentially productive dry land with water pump-lifted a maximum of about 300 feet from the equalizing reservoir and distributed through canals and pipeline. This development would to some extent compensate for losses in the irrigable land area of the Columbia Basin project resulting from withdrawals, Atomic Energy Commission restriction, and military uses.

Milton-Freewater Project, Oregon and Washington

PROJECT INVESTIGATIONS

The project lands lie along Walla Walla River in Walla Walla County, Wash., and Umatilla County, Oreg., extending from near the twin cities of Milton and Freewater, Oreg., to near the confluence of Walla Walla and Columbia Rivers at Wallula, Wash. Purpose of the investigation is to examine the possibilities of providing supplemental irrigation water to about 12,000 acres and a full supply to about 20,000 acres of new lands. The project is comprised of two divisions. The upper, with about 5,000 acres of presently dry-farmed land, would be served water from a storage reservoir on the river above Milton by gravity diversion or low-lift pumping. Development of the upstream dam site may include power generation facilities. The lower division, with about 27,000 acres, would be served by a pumping plant near Wallula lifting water from the pool behind McNary Dam and a canal extending eastward through the Gardena area. The studies will include consideration of benefits to flood control, fish and wildlife, and recreation.

McNary Gravity Project, Oregon and Washington

PROJECT INVESTIGATIONS

An investigation is being made to determine areas on both sides of the Columbia River that could be furnished with gravity water from McNary Dam for irrigation or other urban use. McNary Dam is under construction by the Corps of Engineers near Umatilla, Oreg.

Okanogan Project, Washington

INVESTIGATIONS OF EXISTING PROJECTS

This survey is to determine the condition of storage works serving the Okanogan irrigation district. It has been reported that the spillway of the Conconully Dam is in an unsafe condition and that the face of the dam needs to be riprapped. An investigation will be made to determine the most feasible method of accomplishing the needed rehabilitation.

Okanogan River Basin, Wash.

RECONNAISSANCE

The Okanogan sub-basin of the Columbia Basin comprises portions of Okanogan and Douglas Counties bordering Okanogan and Columbia Rivers in north-central Washington. Principal towns in the area along the Okanogan River's 80-mile reach from its confluence with Columbia River northward to its junction with Similkameen River are Brewster, Omak (Okanogan County seat), Okanogan, Tonasket, and Oroville. Approximately 23,000 acers of irrigated and potentially irrigable land lie in narrow strips along Okanogan River and its tributaries.

Purpose of the investigation is to examine means of providing water for inadequately irrigated and potentially irrigable lands in the basin either by diversion of Columbia River water or by storage of surplus waters of the basin. Possibilities for hydroelectric generation and for firming power generated downstream on Columbia River will also be examined.

Operation and Maintenance Cost and Replacement Analysis, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation is—

1. To obtain a functional breakdown of costs of operating and maintaining irrigation systems.
2. To obtain a functional breakdown of cost of replacement items.
3. To evaluate the extent to which, and under what conditions, certain physical and organizational factors influence these costs.
4. To provide a basis for setting up a uniform accounting system which will provide more useful information from operating projects, and develop basic information for forecasting operation and maintenance costs under a wide variety of circumstances.

Detailed data on operation, maintenance, and replacement costs are urgently needed to permit more accurate estimates to be made for projects in the planning phase. Also, operating projects urgently need some criteria which can be used to compare current operation and maintenance and replacement costs; a study of the nature outlined herein would enable criteria to be set up based upon firm experience data.

Sanpoil-Kettle River Project, Washington

RECONNAISSANCE

Areas of approximately 9,000 acres in Kettle River Valley and about 1,000 acres along Sanpoil River in Ferry County, Wash., appear to afford possibilities for irrigation development. Water supply studies will be made to determine how much water is available. A reconnaissance-level classification of the lands will be made to determine the extent of the irrigable area, and a search for suitable reservoir sites and pumping plant locations along the rivers will be made.

Sequim Project, Washington

PROJECT INVESTIGATIONS

The purpose of this project is to provide supplemental water to about 18,000 acres of presently inadequately irrigated land. The project is located in Clallam County in the Olympic Peninsula of northwestern Washington and lands lie on both sides of Dungeness River, the main source of irrigation supply. The area is screened from rain-bearing winds by the Olympic Mountains, and, although the area receives ample rainfall, the project area is critically short of water during the late growing season.

Sprinkler Irrigation, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Purpose of this investigation is to assemble basic information relating to sprinkler irrigation. Studies will include analysis of the effect on yield, the associated costs related to various land types and crops, and water requirements when application is by sprinkler. The study will be carried out within the region. Such information is necessary for the proper selection of irrigation systems and the determination of feasibility of potential projects. The data obtained from this study will aid not only in the project planning phase, but will be usable on existing projects when the water users consider conversion to sprinkler application.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the West which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in

many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water-deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

Upper Horse Heaven Project, Washington

PROJECT INVESTIGATIONS

The purpose of the investigation is to provide a full supply of water to about 140,000 acres of new land. The investigation will involve detailed studies in engineering, hydrology, geology, and economics.

This project is located in southern Washington and consists of a large tract of land lying adjacent to the Columbia River in Benton and Klickitat Counties. Present proposals are for irrigation by diversions from Klickitat River.

Walla Walla Project, Washington

PROJECT INVESTIGATIONS

The purpose of the project is to provide supplemental water to inadequately irrigated lands near Walla Walla and to develop some new lands. Incidental benefits which may accrue will be from flood control, fish and wildlife preservation and propagation, and recreation. The project is located in southeastern Washington in Walla Walla County near the city of Walla Walla, on and adjacent to Mill Creek.

Yakima Project, Kennewick Division, Washington

ADVANCE PLANNING

The Kennewick division of the Yakima project was authorized by act of June 12, 1948 (Public Law 629, 80th Cong.). The Kennewick division, located directly above the junction of the Yakima and Columbia Rivers in south-central Washington, is the last division of the Yakima project to be developed from the water resources of the Yakima River. The present authorization provides for a combined irrigation and power development designed to serve 20,961 acres, of which 16,693 acres are undeveloped range lands and 4,268 acres are presently irrigated by pumping from the Columbia canal. The hydroelectric plant would have an installed capacity of 12,000 kilowatts. Diversions will be made from an existing dam at Prosser, Wash., and water discharged into a power canal enlarged and extended to carry the additional water to the proposed Chandler power site, which will supplant the existing 2,400-kilowatt Prosser power plant. Hydraulic powered pumps will pump 460 cubic feet per second of water to a height of 103 feet through a pipeline across the Yakima River to a main canal on the south bank. The main canal will extend eastward 43 miles to reach the main block of irrigable land adjoining the city of Kennewick. Energy produced will be transmitted through facilities to be constructed by the Bonneville Power Administration, thereby connecting the Chandler plant in with the Northwest power pool. Detailed land classifications and appraisals of the district lands will be made leading to economic studies incident to negotiating repayment contracts with the Kennewick irrigation district, which will provide irrigation water for some 365 new farms.

Yakima Project, Sunnyside Division, Washington

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to outline a plan to adjust the economic and financial aspects of the existing contracts with irrigation districts of Sunnyside division of the Yakima project in Washington. Existing contract terms, the need for readjustment, and the problems involved will vary with each district. Therefore, each district must be investigated separately.

Yakima Project, Supplemental Storage, Washington

PROJECT INVESTIGATIONS

The Yakima project embraces nearly a half-million acres along Yakima River in Kittitas, Yakima, and Benton Counties in central Washington. Development of the project, begun in 1907, is continuing. Purpose of the investigation is to explore possibilities for obtaining additional storage capacity as means of avoiding possible water shortages under full development of the irrigable acreage with as little detriment to stream flow for migratory fish as possible. Investigations of the Bureau will be coordinted with those of the Corps of Engineers in order to take advantage of all possible flood-control benefits creditable to operation of existing and proposed new reservoirs.

WYOMING

Agricultural Surpluses and Land Development, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

Since the end of World War II, the general question of agricultural surpluses has been given increasing attention. Some individuals have criticized the reclamation program on the ground that it merely contributes to those surpluses. The purpose of this investigation is to make a careful appraisal of both the short- and long-run effects of land development upon agricultural surpluses. The study will cover both the theoretical and historical aspects of the problem. It will include consideration of all land development in the Nation with special emphasis upon irrigation in the Western States. It will also include a consideration of the dynamics of land development and the related effect upon population, income, and demand for agricultural products.

Colorado River Storage Project, Colorado, New Mexico, Utah, and Wyoming

PROJECT INVESTIGATIONS

The project area includes upper Colorado River Basin lands and adjacent lands in the States of Colorado, New Mexico, Utah, and Wyoming. To permit these States to beneficially consume their share of Colorado River water as apportioned by the 1922 Santa Fe compact and fulfill their obligations for downstream delivery as further specified therein, reservoir storage must be provided for hold-over of surplus flows during periods of high run-off to supplement reduced river flows at Lee Ferry in low runoff periods.

The purpose of this investigation is to determine a system of reservoirs that will yield the maximum water supply for irrigation by confining reservoir storage losses to an economic minimum, and simultaneously accomplish all other possible purposes of multiple-purpose operation, including river regulation, power development, recreation, fish and wildlife conservation, and sediment retention.

Colorado River Storage Project, Flaming Gorge Unit, Utah and Wyoming

PROJECT INVESTIGATIONS

As a unit of the Colorado River storage project, this dam and reservoir would provide nearly 3,000,000 acre-feet of active storage capacity for river regulation. The dam site is located in Red Canyon near the Utah-Wyoming State line and the dam would be the farthest upstream unit of the project on Green River. Extensive investigations of possible power sites in this section of the river have been conducted by both public and private agencies for 30 years. Recently the added feature of a possible gravity irrigation diversion from this site to replace the potential central Utah project diversion of Uinta Basin waters into Bonneville Basin has made attractive the present Ashley dam site, which is downstream from other sites previously contemplated. Replacement water thus diverted to Uinta Basin would assure a full regulated water supply to approximately 170,000 acres of land now irrigated and would also serve 77,000 acres of new land.

Columbia River Basin, Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Nevada

BASIN SURVEYS

The Columbia River drains a watershed of 259,000 square miles in the Pacific Northwest. It has been called the heartland of the Northwest. A plan for comprehensive development of the basin's water resources has been prepared by the Bureau of Reclamation for the Department of the Interior. A second similar plan has been prepared by the Corps of Engineers of the Department of the Army. These two plans have been coordinated by agreement between the two departments. (Interior's report is H. Doc. No. 473, 81st Cong.)

The Bureau of Reclamation has a number of responsibilities for continuing investigations related to the plan for comprehensive development of the Columbia River Basin. These responsibilities stem from recommendations in the departmental report, from the agreement between the Interior and Army Departments, and from actions of interagency committees in the Pacific Northwest who are concerned, in part, with development of the Columbia River Basin.

Excess Land Survey, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation, which is region-wide, is to gather and analyze all data relating to compliance with the acreage limitations of reclamation law and to bring all violations into compliance with the law and with the irrigation districts' contracts with the United States. A periodical inventory of this nature is necessary because of the constantly changing pattern of land holdings.

General Power Studies, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of these investigations is to develop and implement the regional power plan and program which would enable maximum economic development and utilization of power and water resources of the area. Full development of the region's power plan will require technical studies for (1) the planning of a program for development of power resources and power systems or parts thereof, (2) the marketing and sale of power, and (3) the establishment of rate schedules.

These power studies involve power plant, system, and intersystem planning, as well as power site and capacity determinations, transmission requirements, coordination of plants and systems, technical studies for the development of power resources, the marketing and sale of power, the establishment of rate schedules, average rate and repayment studies covering existing and proposed projects and estimated financial operation until complete return of costs borne by power are effected, and preparation and interchange of technical data incidental to the plans of other agencies. Such agencies include Corps of Engineers, Bonneville Power Administration, public and privately owned utilities, State power administrations, Federal Power Commission, and other State and Federal agencies.

La Barge Project, Wyoming

PROJECT INVESTIGATIONS

The La Barge project consists of irrigation development of lands paralleling the west bank of the Green River between the towns of La Barge and Big Piney in western Wyoming. About 8,000 acres of new land would be furnished a full water supply.

A full water supply for the La Barge project by direct diversion of natural flow from the Green River would be obtained. The purpose of the investigation is to determine the most feasible plan for the development and to determine the desirability of the undertaking as a Federal reclamation project.

La Prele Unit, Oregon Trail Division, Wyoming

PROJECT INVESTIGATIONS

The purpose of this investigation is to gather information relative to the water supply of the La Prele unit, and the extent and need of rehabilitation of the La Prele Dam and distribution system. Is it the further purpose of this investiga-

tion to write a report of the feasibility of rehabilitation on this project. The present water supply for this project is not ample for a substantial agriculture economy. The State engineer for the State of Wyoming has forbidden the storage of water by the La Prele Dam during the winter months for the past several years. The investigations will result in the development of plans for the rehabilitation of the dam in the distribution system and to encourage the economical use of water in the unit area. These studies will also determine the extent of potential flood sedimentation benefits. The project is located some 12 miles west of Douglas, Wyo., and consists of approximately 12,000 acres of irrigable land.

Lyman Project, Wyoming

PROJECT INVESTIGATIONS

The Lyman project is located in Bridger Valley, Uinto County, western Wyoming. Lands to be served lie along Blacks Fork Creek and its tributary Smiths Fork in the vicinity of the towns of Lyman, Fort Bridger, and Mountain View.

The purpose of the investigation is to determine the possibility of storage of high spring flows of Blacks Fork and Smiths Fork for use later during the irrigation season as a supplemental supply for 40,600 acres of presently irrigated land. Water shortages in the area are experienced every year with consequent heavy loss of farm crops. Drainage in certain portions of the project and rehabilitation of the existing canal and distribution system are included as part of the project.

Operation and Maintenance Cost and Replacement Analysis, Idaho, Montana, Oregon, Washington, and Wyoming

GENERAL ENGINEERING AND RESEARCH

The purpose of this investigation is—

1. To obtain a functional breakdown of costs of operating and maintaining irrigation systems.
2. To obtain a functional breakdown of cost of replacement items.
3. To evaluate the extent to which, and under what conditions certain physical and organizational factors influence these costs.
4. To provide a basis for setting up a uniform accounting system which will provide more useful information from operating projects, and develop basic information for forecasting operation and maintenance costs under a wide variety of circumstances.

Detailed data on operation, maintenance, and replacement costs are urgently needed to permit more accurate estimates to be made for projects in the planning phase. Also, operating projects urgently need some criteria which can be used to compare current operation and maintenance and replacement costs; a study of the nature outlined herein would enable criteria to be set up based upon firm experience data.

Financial Adjustments, Riverton Project, Wyoming

INVESTIGATION OF EXISTING PROJECTS

The purpose of this investigation is to analyze the repayment ability of the water users of the Midvale irrigation district; to complete the allocation of costs between the Midvale irrigation district, the third division, and power; to prepare a detailed repayment report on the Midvale irrigation district and to negotiate an amendatory repayment contract with the Midvale irrigation district. To accomplish the foregoing, it will be necessary to adjust the total obligation in accordance with the revised allocation of costs, and complete land classification. Negotiations for repayment of rehabilitation and betterment work, emergency funds and adjustment in the manner in which the joint works are to be operated must be accomplished.

Water Conservation and Development, Riverton Project, Wyoming

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this program is to develop improved irrigation practices on the Riverton project which are necessary to stop the encroachment of seeped areas upon the presently productive land. It also involves studies and demonstrations relating to the relationships between soils and water and the various salts which inhibit free drainage and crop growth. This work will be carried on in connection with the lands in the Midvale irrigation district.

Seedskadee Project, Wyoming

PROJECT INVESTIGATIONS

The Seedskadee project area is situated in Lincoln and Sweetwater Counties in western Wyoming along each side of the Green River. There are no towns within the project area, but Green River, Wyo., is approximately 14 miles southeast from the southern end of the area.

Purpose of the investigation is to determine possibilities of providing irrigation water for 60,720 acres of arable land located on benches and terraces adjacent to Green River.

The plan of development involves a diversion dam on the Green River, distribution canals and laterals, and two pumping plants.

Financial Adjustments, Shoshone Project, Wyoming

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation has been to arrive at revised repayment arrangements on the Willwood and Frannie divisions, in order that the manner in which the obligations are repaid will be within the repayment ability of the water users. On the Garland division, investigations have involved the classification of the lands pursuant to the 1926 Omnibus Adjustment Act and the 1939 Reclamation Project Act.

Water Conservation Studies, Shoshone Project, Wyoming

INVESTIGATIONS OF EXISTING PROJECTS

The purpose of this investigation is to provide, in cooperation with the University of Wyoming and Soil Conservation Service, the technical assistance necessary to improve the irrigation and managerial practices on all divisions of the Shoshone project and the technical assistance to water users of the Frannie division in reclaiming nonproductive land and adoption of better agricultural and irrigation practices as contemplated by the amendatory repayment contract.

Sprinkler Irrigation, Idaho, Montana, Oregon, Washington and Wyoming

GENERAL ENGINEERING AND RESEARCH

Purpose of this investigation is to assemble basic information relating to sprinkler irrigation. Studies will include analysis of the effect on yield, the associated costs related to various land types and crops, and water requirements when application is by sprinkler. The study will be carried out within the region. Such information is necessary for the proper selection of irrigation systems and the determination of feasibility of potential projects. The data obtained from this study will aid not only in the project planning phase, but will be usable on existing projects when the water users consider conversion to sprinkler application.

Sublette Project, Wyoming

PROJECT INVESTIGATIONS

The Sublette project embraces related development in Upper Green River Basin in western Wyoming. Pinedale, Wyo., may be considered as the general project center with project features located in Sublette and Sweetwater Counties.

The purpose of the investigation is to determine the possibilities of developing storage for regulation of stream flow for irrigation and power generation. Flood and silt control and quality of water are not primary problems in the project area but high spring runoff followed by comparatively low late summer and fall discharges create regulatory problems.

The project is comprised of three principal divisions—namely, the Buckskin, West Side, and Daniel. New and old lands of the project are expected to total about 160,000 acres. Ten or more dams are expected to be involved as well as three or four power generating plants totaling 84,000 kilowatts in capacity.

Sublette Project, Buckskin Division, Farson Unit, Wyoming

PROJECT INVESTIGATIONS

The Farson unit will comprise lands in Eden Valley in Sweetwater County, western Wyoming, surrounding the towns of Farson and Eden. A water supply for some 20,000 acres of arable desert land not included in the recently authorized Eden project would be developed for irrigation. Water would be imported from tributaries of New Fork River (Boulder Creek, East Fork, and Silver Creek) to serve these lands. Storage will be required within the Big Sandy watershed to reregulate the imported water.

Sublette Project, Buckskin Division, Pinedale Unit, Wyoming

PROJECT INVESTIGATIONS

The Pine dale unit embraces opportunities for irrigation and power in the upper northeast portion of the Green River Basin in Sublette County, Wyo. Lands to be irrigated lie along the western slope foothills of the Wind River Mountains. Boulder, Wyo., is near the geographical center of the area.

The purpose of the investigation is to determine the possibilities of developing storage for regulation of stream flow for new and supplemental irrigation of 58,000 acres and generation up to about 84,000 kilowatts of electrical energy. Water for irrigation and power would be controlled by a system of reservoirs at the Kendall, Fayette Lake, Meadow Lake, Burnt Lake, Boulder Lake, and Medina sites. Flood and silt control are not problems in the area.

Teton Basin Project, Idaho and Wyoming

PROJECT INVESTIGATIONS

This project is located in Teton Basin, Teton County, Idaho, and Teton County, Wyo. The town of Driggs, Idaho, which is the county seat of Teton County, Idaho, is situated approximately in the center of the project.

Supplemental water is needed for the presently irrigated lands of the project and there are large areas of dry land believed to be suitable for irrigation if a water supply can be developed. Therefore, the purposes of this investigation are (1) to inventory and evaluate the potential irrigation development opportunity in Teton Basin, (2) to advance a plan of reclamation development concordant with the potentialities of the area, (3) to make such detailed studies as necessary to prepare a possibility report on the development as a whole or such part as may appear justified under present economic relationships.

Interstate division of the water supply has been referred to the Snake River Compact Commission of Idaho and Wyoming and information on irrigated areas will also be obtained for this Commission.

United Western Investigation, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

RECONNAISSANCE

It has been apparent for many years that an unbalanced condition of water supply exists in that portion of the country including and lying west of the States of Montana, Wyoming, Colorado, New Mexico, and Texas.

On the one hand there are vast areas of semiarid lands in many parts of the west which cannot be brought into production for lack of sufficient locally available water, and some developed areas which will require imported water even to maintain the present degree of development. Nonagricultural development in many areas has reached its upper limit unless an additional supply of water is imported.

On the other hand there is every indication that there is a supply of water in streams emptying into the Pacific Ocean in the Northwest and northern California which is far in excess of any consumption which might be visualized under conditions of maximum ultimate development.

The purpose of the united western investigation is to make a reconnaissance to determine if there is sufficient likelihood of a plan with engineering and economic feasibility to warrant a detailed investigation of the possibility of supplying these water deficient areas with a portion of the vast water surpluses in the areas of the Northwest.

YAMPA RIVER PROJECT, LITTLE SNAKE DIVISION, SAVERY-POT HOOK UNIT, WYOMING AND COLORADO

PROJECT INVESTIGATIONS

The area involved in this investigation is located along the Colorado-Wyoming border within the basin of the Little Snake River, a tributary of Yampa River. The land areas to be served are located along the valley of Little Snakey River and adjacent mesas between Slater, Colo., and a point south of Baggs, Wyo.

Purpose of the investigation is to determine the possibilities of developing storage water on Savery Creek and at the Pot Hook site on Slater Creek to serve lands now inadequately irrigated and for the irrigation of new lands.

Major features would include reservoirs at the Savery and Pot Hook sites, a feeder canal from Little Snake River, two distribution canals, and the extension and enlargement of an existing canal. The project would provide a full supply for around 45,000 acres of new and inadequately irrigated land.

POTENTIAL PROJECTS FOR WHICH FUNDS ARE NEEDED FOR DRILLING AND DETAILED SURVEYS

(Does not include authorized projects)

Bitterroot Valley project, Montana [1]
Cambridge Bench project, Idaho [1]
Canby project, Oregon [1]
Columbia Basin project, Washington, modification of Grand Coulee Dam for flood control [1]
Council project, Idaho [1]
Crooked River project, Oregon [1]
Hells Canyon project, Idaho, Oregon [1] [4]
Mann Creek project, Idaho [1]
Missoula Valley project, Montana, north side unit [1]
Mountain Home project, Idaho [1]
The Dalles project, Oregon, western division [1]
Upper Star Valley project, Wyoming [1]
Vale project, Oregon, Bully Creek extension [1]
Central Valley project (ultimate plan), California
- Calaveras River division, New Hogan unit [2]
- Kings River division,[2] Pine Flat unit and North Fork Kings unit
- Stanislaus River division, New Melones unit [3]
- Stony Creek division, Black Butte unit [2]
- Trinity River division

Colorado River storage project: Green division, Echo Park unit and Flaming Gorge unit; Gunnison division, Whitewater unit; Middle River division, Glen Canyon unit; San Juan division, Navajo (Martinez) unit.
Central Utah project, Utah, initial phase [3]
Emery County project, Utah [3]
Florida project, Colorado [3]
Hammond project, New Mexico [3]
La Barge project, Wyoming [3]
Lyman project, Wyoming [3]
Pine River project extension, Colorado, New Mexico [3]
Seedskadee project, Wyoming [3]
Silt project, Colorado [3]
Smith Fork project, Colorado [3]
Canton project, Oklahoma
Anadarko (Fort Cobb) project, Oklahoma
Canadian River project, Texas (authorized)
Central Arizona project, Arizona, New Mexico
Collbran project, Colorado
Dixie project, Utah
Gunnison-Arkansas project, Colorado, initial phase
Lower Nueces River project, Texas

[1] Projects recommended in Columbia River Basin comprehensive plan.
[2] Projects recommended in Central Valley comprehensive plan.
[3] Projects recommended as participating projects in the recommended Colorado River storage project.
[4] $8,000,000 for construction included in President's budget if authorizing legislature is enacted.

PROPOSED PROJECTS

Anadarko Project (Cobb Creek)

Location.—In Washita River Basin near Fort Cobb, Okla.
Estimated cost.—$15,360,000.
Purposes.—Irrigation: New, 9,000 acres; municipal and industrial water.
Status of report.—Will be included in Washita River Subbasin report, initial draft of which will be submitted to Washington in April 1951.
Other comments.—None.

Bitterroot Valley Project (Includes Woodside Unit)

Location.—On Bitterroot River tributary to Clark's Fork in west-central Montana.
Estimated cost.—$8,748,000.
Purpose.—Irrigation: New, 1,700 acres; supplemental, 48,300 acres.
Status of report.—Supplemental report to Columbia Basin Report transmitted to the Congress February 3, 1950.
Other comments.—Will require $6,248,000 assistance from proposed Columbia Basin account.

Cambridge Bench Project

Location.—Weiser Valley in west-central Idaho.
Estimated cost.—$474,000.
Purpose.—Irrigation: Supplemental, 2,360 acres.
Status of report.—Supplemental report to Columbia Basin report transmitted to the Congress February 3, 1950.
Other comments.—Will require $197,000 assistance from proposed Columbia Basin account.

Canby Project

Location.—Near town of Canby on Malalla River, a tributary to Willamette River, Oreg.
Estimated cost.—$961,000.
Purpose.—Irrigation: New, 3,270 acres.
Status of report.—Supplemental report to Columbia River Basin report transmitted to the Congress February 3, 1950.
Other comments.—None.

Canton Project

Location.—On North Canadian River near Canton, Okla.
Estimated cost.—$4,671,000.
Purpose.—Irrigation: New, 16,000 acres.
Status of report.—Report recently received and under review by Washington and Denver Offices of Bureau of Reclamation.
Other comments.—Total estimated cost includes $91,900 expended by Army engineers for irrigation water outlet works at Canton Dam.

Central Arizona Project

Location.—Colorado River Basin, Arizona, New Mexico
Estimated cost.—$738,408,000.
Purposes.—Irrigation: Of the 566,200 acres that were irrigated during the 1940–44 period, approximately 152,500 will revert to dry land because of failing water supply. However, with the project, 639,700 acres would be assured a firm water supply and this includes 73,500 acres that now receive no water. Power: 770,000 kilowatts. Municipal water, flood control, salinity control, silt retention, river regulation, recreation, and fish and wildlife propagation.
Status of report.—Report transmitted to the Congress September 16, 1948.
Other comments.—This is designed primarily as a rescue project to maintain and improve the economy of a large area in Arizona.

Central Valley Project

ADDITIONAL FEATURES

Location.—Calaveros, Stanislaus, Kings, Kaweah, Tule, and Kern Rivers of San Joaquin River Basin and Stoney Creek of Sacramento River Basin, Calif.
Estimated cost.—$95,708,000.
Purposes.—Irrigation: New, 200,000 acres; supplemental, 1,000,000 acres. Power: 113,000 kilowatts. Flood control and recreation.
Status of report.—Report transmitted to the Congress August 29, 1949. Additional letter sent to the Congress November 2, 1949. Draft of legislation and appropriate letter sent to the Congress November 13, 1950.
Other comments.—Additional features listed in November 13, 1950, letter.

Central Valley Project, Kings River Division, North Fork, Kings Unit

INITIAL STAGE

Location.—Kings River, Calif.
Estimated cost.—$78,060,000.
Purpose.—Power: 70,000 kilowatts.
Status of report.—Report transmitted to the Congress on March 20, 1950.
Other comments.—$4,440,000 Pine Flat power plant not included in total estimated cost as this power plant is included in the Central Valley project (additional features). The 70,000 kilowatts represents additional power capacity to be developed and does not include the Pine Flat power plant capacity.

Central Valley Project, Trinity River Division

Location.—Trans-basin diversion of water from Trinity River Basin to Sacramento River Basin in northwestern California.
Estimated cost.—$142,616,000.
Purpose.—Irrigation: New, 250,000 acres. Power: 206,000 kilowatts. Recreation.
Status of report.—Report now under preparation in field and proposed report is scheduled for submission to Washington in June 1951.
Other comments.—The figures indicated here are very preliminary but will be firmed up as soon as the planning report is available for review. This project is attractive as a substantial block of power could be brought into production in a relatively short period.

Collbran Project

Location.—On Plateau Creek tributary to Colorado River in vicinity of Grand Junction, Colo.
Estimated cost.—$13,299,000.
Purposes.—Irrigation: New, 2,310 acres; supplemental, 18,340 acres. Power: 7,400 kilowatts. Municipal water.
Status of report.—Report transmitted May 9, 1950, to the President through Bureau of the Budget, where action is awaited.
Other comments.—None.

Colorado River Storage Project, and Participating Projects

INITIAL DEVELOPMENTS

Location.—Upper Colorado River Basin, Arizona, Colorado, New Mexico, Utah, and Wyoming.
Estimated cost.—$1,002,202,800.
Purposes.—Irrigation: New, 132,870 acres; supplemental, 267,300 acres. Power: 1,234,000 kilowatts. River regulation, flood control, sediment retention, fish and wildlife conservation, and recreation.
Status of report.—Report sent to interested States and Federal agencies for official review.
Other comments.—Figures as shown here do not include initial participating Eden project which is now authorized. Also not included is the participating Shiprock Indian project which, if authorized, will be constructed by Bureau of Indian Affairs.

Council Project

Location.—On Weiser River near Council, Idaho.
Estimated cost.—$1,960,000.
Purpose.—Irrigation: New, 1,650 acres; supplemental, 2,560 acres.
Status of report.—Supplemental report to Columbia Basin Report transmitted to the Congress February 3, 1950.
Other comments.—Will require $948,000 assistance from proposed Columbia Basin account.

Crooked River Project

Location.—On Crooked River tributary to Deschutes River near Prineville, Oreg.
Estimated cost.—$5,278,000.
Purposes.—Irrigation: New, 9,900 acres; supplemental, 10,220 acres. Flood control, fish and wildlife conservation, and recreation.
Status of report.—Supplemental report to Columbia River Basin Report transmitted to the Congress, February 3, 1950.
Other comments.—Will require $1,846,000 assistance from proposed Columbia Basin account.

Grand Coulee Dam

MODIFICATION FOR FLOOD CONTROL

Location.—Columbia Basin project, main stem of Columbia River, Wash.
Estimated cost.—$2,750,000.
Purpose.—Flood control.
Status of report.—Supplemental report to Columbia River Basin Report transmitted to the Congress, February 3, 1950.
Other comments.—None.

Gunnison-Arkansas Project

INITIAL DEVELOPMENT

Location.—Trans-Continental Divide diversion from Roaring Fork River to Arkansas River in central Colorado.
Estimated cost.—$147,440,000.
Purposes.—Irrigation: Supplemental 322,000 acres. Power: 104,800 kilowatts. Municipal water, flood and sediment control, stream pollution abatement, fish and wildlife conservation, and recreation.
Status of report.—Report to be submitted to Washington by field in February 1951.
Other comments.—None.

Lower Nueces Project

Location.—In lower Nueces River Basin near Oakville, Tex.
Estimated cost.—$38,829,000.
Purposes.—Municipal and industrial water, flood control, recreation and fish and wildlife conservation.
Status of report.—Report to be submitted to the Washington office by field in February 1951.
Other comments.—None.

Mann Creek Project

Location.—Weiser Valley in west-central Idaho.
Estimated cost.—$1,949,000.
Purpose.—Irrigation: New, 270 acres; supplemental, 4,030 acres.
Status of report.—Supplemental report to Columbia Basin report transmitted to the Congress February 3, 1950.
Other comments.—Will require $1,502,000 assistance from proposed Columbia Basin account.

Missoula Valley Project

Location.—Upper Clark Fork River, Mont.
Estimated cost.—$184,000.
Purpose.—Irrigation: Supplemental, 1,200 acres.
Status of report.—Supplemental report to Columbia River Basin report transmitted to the Congress February 3, 1950.
Other comments.—Will require $112,000 assistance from proposed Columbia Basin account.

Paonia Project

Location.—North Fork, Gunnison River in western Colorado.
Estimated cost.—$6,191,000.
Purpose.—Irrigation: New, 2,210 acres, supplemental, 14,830 acres.
Status of report.—Report to be submitted to Washington by field in February 1951.
Other comments.—This project included as a participating project in the initial development, Colorado River storage project and participating projects.

Snake River Projects (Hells Canyon Project and Mountain Home Project)

HELLS CANYON PROJECT

Location.—Grand Canyon section of Snake River between Idaho and Oregon.
Estimated cost.—$357,000,000.
Purposes.—Power: 900,000 kilowatts. Flood control, navigation, and recreation.
Status of report.—Supplemental report to Columbia Basin report transmitted to the Congress February 3, 1950.
Other comments.—None.

MOUNTAIN HOME PROJECT

Location.—Between North and Middle Forks of Payette River, Idaho.
Estimated cost.—$47,400,000.
Purposes.—Power: 120,000 kilowatts.
Status of report.—Supplemental report to Columbia Basin report transmitted to the Congress February 3, 1950.
Other comments.—Includes certain power features only.

The Dalles Project, West Unit

Location.—On Main stem of Columbia River, Wasco County, Oreg.
Estimated cost.—$2,300,000.
Purpose.—Irrigation: New, 4,500 acres.
Status of report.—Supplemental report to Columbia River Basin report transmitted to the Congress February 3, 1950.
Other comments.—None.

Upper Star Valley Project

Location.—On Salt River in western Wyoming.
Estimated cost.—$3,892,000.
Purposes.—Irrigation: Supplemental, 21,720 acres. Fish and wildlife conservation.
Status of report.—Supplemental report to Columbia River Basin report transmitted to the Congress February 3, 1950.
Other comments.—Will require $2,985,000 assistance from proposed Columbia Basin account.

Vale Project, Bully Creek Extension

Location.—Malheur County ner Vale, Oreg.
Estimated cost.—$2,846,000.
Purposes.—Irrigation: New, 4,000 acres; flood control and fish and wildlife conservation.
Status of report.—Supplemental report to Columbia River Basin report transmitted to the Congress February 3, 1950.
Other comments.—Will require $2,080,000 assistance from proposed Columbia Basin account.

BUREAU OF RECLAMATION

Boise Project, Black Canyon Dam, Idaho

REHABILITATION AND BETTERMENT

Total estimated cost	$300,000
Estimated cost to June 30, 1951	0
Planning funds programed, fiscal year 1952	0
Minimum funds required to initiate construction and carry through 1 fiscal year	60,000
Balance to complete	240,000

The Black Canyon Dam and power plant, completed in 1925, is located on the Payette River approximately 6 miles from Emmett, Idaho. The purpose of the dam and power plant is (1) to provide power for a turbine-driven pumping plant supplying water to 18,000 acres of land in the Emmett irrigation district; (2) to generate power from the 10,000-kilovolt-ampere hydroelectric power plant at the dam; and (3) to act as a diversion dam to divert water into the Black Canyon main canal, serving the Payette Division lands of the Boise project.

The need for rehabilitation work on the dam itself has become increasingly apparent in the last few years. The concrete on the downstream face of the dam has disintegrated to a depth of from 3 to 6 inches along the horizontal and vertical joints and elsewhere on the face of the dam. Leakage of water through the construction and contraction joints, together with alternate freezing and thawing, are causing spalling of the concrete. Water in the galleries of the dam has caused deterioration of electric wiring and other installations. Safety of the dam is not threatened at present; however, it is important that corrective measures be taken before disintegration of the concrete progresses to more serious proportions. To delay this rehabilitation work will increase the costs considerably.

The general investigations program for fiscal year 1952 as shown in the justification for appropriations includes $1,000 for negotiation of an amendatory repayment contract covering the cost of this rehabilitation work. Additional funds in the amount of $60,000 for fiscal year 1952 would permit the initiation of work, primarily on the sealing of the joints.

Canadian River Project, Texas

Total estimated cost	$85,383,000
Estimated cost to June 30, 1951	67,195
Planning funds programed, fiscal year 1952	100,000
Minimum funds required to initiate construction and carry through 1 fiscal year	4,660,000
Balance to complete	80,555,805

The Canadian River project is located in the northwestern part of Texas, with Sanford Reservoir the primary conservation and control structure located on the Canadian River near Amarillo. In addition to Sanford Reservoir, the project includes a system of pumping plants and pipelines for the delivery of surface water to 11 cities in the high plains region to the south. The provision of surface water for use by these cities will minimize ground water for irrigation use in the area. In addition, this reservoir would provide benefits from flood control along the Canadian River, fish and wildlife conservation, and recreational opportunities.

The fiscal year 1952 justification for appropriations include $100,000 of advance planning funds for the assembly of engineering design data. The availability during fiscal year 1952 of additional funds in the amount of $4,660,000 would permit the completion of final designs and specifications and award of construction contracts late in fiscal year for Sanford Dam, six pumping plants, and the first sections of the aqueduct system. These funds would also permit work to continue on the preparation of final designs and specifications for the remaining pumping plants and additional sections of the pipeline.

Central Valley Project, California

DELTA STEAM PLANT

Total estimated cost	$33,616,000
Estimated cost to June 30, 1951	68,095
Planning funds programed, fiscal year 1952	0
Minimum funds required to initiate construction and carry through 1 fiscal year	2,000,000
Balance to complete	31,547,905

Upon completion of the Folsom power facilities, the installed power-plant capacity of the Central Valley project will be 615,000 kilowatts. However, a substantial part of this power will be secondary power only due to water deficiencies in dry years and to the fact that water releases are governed by navigation, flood control, and irrigation requirements. The addition of stand-by steam generation for firming of this secondary energy would greatly increase the usefulness and value of the hydro plants, make available large quantities of low-cost firm energy to meet an ever-growing demand, and result in a substantial increase in the project power revenues. For this reason, it is proposed to construct the 330,000-kilowatt Delta steam plant for steam-firming capacity.

No funds are presently programed for work on this feature in fiscal year 1952. With the availability of $2,000,000 in additional funds for the Central Valley project, plans and specifications could be completed and negotiations initiated for the design and construction of the plant, contracts awarded for the steam plant and major equipment for the switchyard, and rights-of-way acquired for the steam plant and switchyard.

CENTRAL VALLEY PROJECT, AMERICAN RIVER DIVISION, SLY PARK UNIT, CALIFORNIA

Total estimated cost	$6,049,000
Estimated cost to June 30, 1951	250,000
Planning funds programmed, fiscal year 1952	0
Minimum funds required to initiate construction and carry through 1 fiscal year	2,457,000
Balance to complete	3,342,000

The Sly Park unit is located along the divide between the American and Cosumnes Rivers in the west central portion of El Dorado County, Calif. Construction of this unit of the Central Valley project will regulate runoff for the irrigation of 3,500 acres of new land and will provide a supplemental supply for the irrigation of 3,850 acres of land now under irrigation with an inadequate water supply. Water will be delivered to the project area by the 9-mile Sly Park-Camino conduit, which will divert water by gravity from Sly Park Dam and Reservoir. The unit will also furnish municipal, industrial, and domestic water for the city of Placerville and nearby small communities.

By the end of fiscal year 1951, work will be well under way on right-of-way surveys, preparation of construction designs and specifications, detailed investigations to locate construction materials, and other engineering surveys to assemble design data. No additional work is presently contemplated during fiscal year 1952. The availability of $2,457,000 of additional funds for fiscal year 1952 would permit the award of construction contracts for the main dam, the diversion dam and tunnel, the temporary camp and office facilities, and the Sly Park-Camino conduit. These funds would also permit the acquisition of the necessary right-of-way and the continuation of engineering work on the remaining facilities.

MIDDLE RIO GRANDE PROJECT, NEW MEXICO

Total estimated cost	$30,179,000
Estimated cost to June 30, 1951	563,626
Planning funds programed, fiscal year 1952	258,000
Minimum funds required to initiate construction and carry through 1 fiscal year	1,000,000
Balance to complete	28,357,374

The Middle Rio Grande project lies in the Middle Rio Grande Valley in the north-central part of New Mexico. Progressive aggradation of the river channel has caused and is causing a continuing general rise in the ground-water table which has resulted in abandonment of productive lands, reduction in the crop yield on the remaining land, delinquency in payment of charges with resulting financial difficulties on the part of the conservancy district, progressive increases in flood drainage, and an inability on the part of New Mexico to deliver water as required by the Rio Grande pact. The plan of development of this project consists of rectification of the channel, improvement of El Vado Dam, and rehabilitation and extension of the irrigation and drainage systems for the purpose of serving 84,876 acres of land.

The fiscal year 1952 justification for appropriations contains $258,000 of advance planning funds for a continuation of preconstruction surveys and investigations necessary to establish a detailed plan of development and detailed

construction plans for the most urgently needed drainage and rehabilitation work will be initiated. Additional funds in the amount of $1,000,000 would permit the initiation of urgently needed channel rectification work, preparation of specifications for the first portion of the drainage system, and the continuation of repayment contract negotiations.

Minidoka Project, Idaho, North Side Pumping Division

Total estimated cost	$10,377,000
Estimated cost to June 30, 1951	770,416
Planning funds programed, 1952	127,000
Minimum funds required to initiate construction and carry through 1 fiscal year	1,745,000
Balance to complete	7,734,584

The north side pumping division is a long-deferred division of the development of the Minidoka project located near Rupert, Idaho. The area consists of 77,650 acres of potentially irrigable public land, 64,000 acres of which are to be irrigated by drilling wells and pumping from ground-water sources and 13,650 acres of which are to be irrigated by pumping from the Snake River. Development of the 64,000 acres will necessitate the drilling of numerous wells throughout the area and the construction of the necessary distribution systems to serve the land. At the present time a number of wells have been completed and the results from the operation of these wells have been very satisfactory. A portion of the reserved water in the American Falls Reservoir augmented by storage from the proposed Palisades project will be used to supply the 13,650 acres. Development of this latter area will necessitate the construction of a pumping plant and a system of canals and laterals.

The present program of $127,000 for fiscal year 1952 will be financed from unobligated balances of prior-year funds and will consist of operation and maintenance of 11 completed wells and appurtenant distribution facilities as well as a small program of surveys and general design work in preparation for further construction. Additional funds in the amount of $1 745,000 would permit the drilling and equipping of the second block of 10 wells, the construction of the appurtenant lateral system, and the construction of 15 miles of the 115-kilovolt transmission line and an extension of the electrical distribution lines to serve the second block of 10 wells. It would also provide for the initiation of drilling operations on the third block of 20 wells and the construction of the necessary appurtenant lateral facilities and distribution lines. Surveys and designs for the 3½-mile-long main canal to serve the 13,650 acres in unit A could be completed and contracts could be awarded for the pumps and motors for the pumping plant.

Owyhee Project, Oregon-Idaho

REHABILITATION AND BETTERMENT

Total estimated cost	$200,000
Estimated cost to June 30, 1951	0
Planning funds programed, fiscal year 1952	0
Minimum funds required to initiate construction and carry through 1 fiscal year	50,000
Balance to complete	150,000

The Owhyee project, comprising 103,499 acres, is located in eastern Oregon, with a small portion located in western Idaho, near the Owyhee and Snake Rivers. Water supply for the project is obtained from the 715,000 acre-feet capacity Owyhee Reservoir and by pumping from the Snake River. Rehabilitation and betterment work to be done on this project consists of gravel lining of approximately 40 miles of the 550-mile canal and lateral system. These waterways, constructed some 15 years ago, are experiencing scouring action which results in uncovering seams and zones of pervious material with the result that water is admitted into the canal banks, causing saturation, and in several instances have resulted in serious bank failures. The work to be done is of such magnitude that it falls outside a normal maintenance activity, it must be carried on under a rehabilitation and betterment program.

No activity is presently programed for this project in fiscal year 1952, but the availability of funds in the amount of $50,000 would permit completion of the repayment negotiations and initiation of placement of the gravel lining on selected reaches of the main canals.

PALISADES PROJECT, IDAHO-WYOMING

Total estimated cost	$76,601,000
Estimated cost as of June 30, 1951	3,551,638
Planning funds programed, fiscal year 1952	35,000
Minimum funds required to initiate construction and carry through 1 fiscal year	10,000,000
Balance to complete	63,014,362

The Palisades Dam and power plant will be located on the main stem of the Snake River about 50 miles east of Idaho Falls, Idaho. Principal construction features of the project include Palisades Dam, the power plant, relocation of 21 miles of State highway and 30 miles of Forest Service road, construction of two 115-kilovolt transmission lines from the power plant to substations near the cities of Idaho Falls and Pocatello, and a single line beyond Pocatello to the proposed Minidoka-American Falls power plant. The 1,400,000 acre-foot Palisades Reservoir will provide supplemental irrigation water for some 650,000 acres of land in the upper Snake River Valley. The 112,500 kilowatt power plant will provide hydroelectric energy to serve irrigation pumping, municipal, and rural cooperative loads, and will also supplement the proposed American Falls power plant when needed to supply power for the Minidoka north side development. Direct flood protection will be provided for several thousand acres of irrigated land on the Snake River plain above Idaho Falls. Indirect flood-control benefits will accrue to more extensive areas farther downstream through the coordinated operation of the reservoir with Corps of Engineers' downstream facilities.

Unobligated balances of prior year funds in the amount of $35,000 will be used during fiscal year 1952 to continue work on the preparation of designs for the dam and reservoir, relocation of property in the reservoir area, and transmission lines and substations. If additional funds in the amount of $9,965,000 were made available, full-scale construction activities could be initiated. The prime contract for the dam and powerhouse could be awarded and important progress made thereunder on the drilling of the river diversion tunnels. Contract awards and progress payments could be made on contracts for the State highway relocation, the Forest Service road relocation, manufacture of turbines and generators, acquisition of rights-of-way in the reservoir area, reservoir clearing, and administrative buildings and housing.

PAONIA PROJECT, COLORADO, SPRING CREEK DAM

Total estimated cost	$4,492,000
Estimated cost to June 30, 1951	432,139
Planning funds programed, fiscal year 1952	89,527
Minimum funds required to initiate construction and carry through 1 fiscal year	785,000
Balance to complete	3,185,334

The need for supplemental irrigation water in this area, which has existed for many years has become increasingly more acute. With the completion of the project distribution system, which will be under construction during fiscal year 1951, this situation will be somewhat improved for about 15,000 acres of the project by the delivery of some unappropriated natural flow from the North Fork River.

Construction of Spring Creek Dam and Reservoir would assure the availability of a full and dependable water supply for the entire project acreage. The fiscal year 1952 program for the Paonia project includes $89,527 for the assembly of additional design data and the substantial completion of the designs and specifications. If additional funds in the amount of $785,000 were made available, it would be possible to complete the designs and specifications and initiate construction on the dam and reservoir.

RIVERTON PROJECT, MUDDY RIDGE CANALS AND LATERALS

Total estimated cost	$4,385,670
Estimated cost to June 30, 1951	910,972
Planning funds programmed, fiscal year 1952	27,771
Minimum funds required to initiate construction and carry through 1 fiscal year	2,694,000
Balanec to complete	752,927

The Muddy Ridge canals and laterals are integral features of the Riverton project, and will deliver water to 22,250 acres of the project land. A delay in the initiation of construction on these facilities will necessarily delay opening of this land for homestead entry and will prevent full and efficient utilization of a number of completed features.

The present fiscal year 1952 program for the Riverton project includes $27,771 for work on the preparation of designs for the Muddy Ridge canals and laterals. The availability of $2,694,000, comprised of $1,467,000 for the Muddy Ridge canal and $1,227,000 for the Muddy Ridge laterals, would permit the completion of the designs and the initiation of construction on these features early in the fiscal year.

Solano Project, California

Total estimated cost	$45, 577, 000
Estimated cost to June 30, 1951	499, 997
Planning funds programed, fiscal year 1952	204, 000
Minimum funds required to initiate construction and carry through 1 fiscal year	6, 000, 000
Balance to complete	38, 873, 003

The Solano project is located largely in Solano County, Calif., which adjoins the northeast extremity of San Francisco Bay. The cities of Fairfield, Suisun, Benicia, and Vallejo as well as military installations of Fairfield-Suisun Air Force base, Benicia arsenal, and Mare Island naval shipyard are located in Solano County and have had rapid growths in recent years with the accompanied increased use of the water. Available water supplies are insufficient for the needs of these cities without consideration of their growth and the possibilities of rapid expansion during a national emergency. One of the primary purposes of the Solano project is to meet the urgent need for water at these military installations in the San Francisco Bay area and the municipal and industrial water demands for the nearby cities. In addition, irrigation requirements in the area are being partially met by pumping from ground-water reserves. The present rate of withdrawal exceeds the rate of inflow during even the wettest year of record. The project is designed to provide a full water supply for about 77,000 acres of highly productive land presently unirrigated and about 5,000 acres presently receiving an inadequate supply.

The project facilities include Monticello Dam, which will create a storage reservoir of approximately 1,600,000 acre-feet; a small downstream diversion dam; a 40-mile Putah south canal and a small terminal reservoir; and the necessary wasteways, laterals, and drainage facilities.

The fiscal year 1952 justification for appropriations include $204,000 of advance planning funds for a continuation of surveys and investigations for the completion of engineering data and the establishment of a detail plan of development. Additional funds in the amount of $6,000,000 would permit the completion of final designs for and the start of construction on the Monticello Dam, relocation of State Highway No. 28, and the first section of the Putah south canal.

Vermejo Project, New Mexico

Total estimated cost	$2, 679, 000
Estimated cost as of June 30, 1951	117, 050
Planning funds programed, fiscal year 1952	10, 000
Minimum funds required to initiate construction and carry through 1 fiscal year	500, 000
Balance to complete	2, 051, 950

The Vermejo project, located in northeastern New Mexico, on the Vermejo River, will provide for the rehabilitation of irrigation facilities for approximately 7,200 acres. The water supply will be provided by the enlargement of three existing reservoirs and the reconstruction of four other existing reservoirs, as well as the construction of one new reservoir for flood and sediment control. The diversion dam, canal, and other distribution works will also be rehabilitated.

The fiscal year 1952 justification for appropriations include $10,000 of advanced planning funds for a relative small program of preconstruction activities on the plan of development. The availability of $500,000 of additional funds would permit completion of designs, award of contracts, and initiation of construction of four of the dams as well as a continuation of preconstruction work on the other four dams, Vermejo canal, and Eagle Trail canal.

WEBER BASIN PROJECT, UTAH

Total estimated cost	$69, 534, 000
Estimated cost to June 30, 1951	947, 361
Planning funds programed, fiscal year 1952	341, 000
Minimum funds required to initiate construction and carry through 1 fiscal year	1, 225, 000
Balance to complete	67, 020, 639

The Weber Basin project is located in north-central Utah near the industrial centers of Ogden and Salt Lake City. The basic plan for the development includes the further regulation of the flows of the Weber River for the development of the basin's remaining water resources for agricultural and municipal use. By upstream storage regulation, more effective utilization of the natural flow from Wasatch slope streams, and development of usable flows and ground water, it will be possible to provide a full season's water supply for about 100,000 acres, including 70,400 acres of potentially productive lands presently unirrigated and approximately 30,000 acres now only partially productive because of shortages. Through drainage the project would also make suitable for irrigation farming about 39,000 acres now waterlogged. In addition, flood damage along the Weber and Ogden Rivers would be materially reduced by storage regulation and canal diversion and water would be made available for use by the cities of Ogden and Salt Lake and other nearby municipalities.

The development of this project will necessitate the enlargement of Pineview Dam and Reservoir, the construction of five additional dams and reservoirs, four diversion dams, four pumping plants, and a system of aqueducts, canals, and laterals to deliver the water to the land.

The fiscal year 1952 justification for appropriations includes $341,000 of advanced planning funds for preconstruction investigations and studies to obtain data for use in the development of the plan of development. The additional funds for fiscal year 1952 in the amount of $1,225,000 would permit the completion of the preparation of construction designs and specifications, the award of contracts, and the initiation of construction on the Weber aqueduct and the Government construction camp.

YAKIMA PROJECT, WASHINGTON, KENNEWICK DIVISION

Total estimated cost	$10, 736, 000
Estimated cost to June 30, 1951	942, 272
Planning funds programed, fiscal year 1952	44, 000
Minimum funds required to initiate construction and carry through 1 fiscal year	1, 674, 000
Balance to complete	8, 075, 728

The Kennewick division, located directly above the confluence of the Yakima and Columbia Rivers in south-central Washington, is the last division of the Yakima project to be developed from the water resources of the Yakima River. The present plan provides for a combined irrigation and power development designed to serve about 21,000 acres of land, of which 16,700 acres are undeveloped range lands and 4,268 acres are presently irrigated by pumping from the existing Columbia canal. The plan also provides for the construction of the 12,000-kilowatt Chandler power plant to supplant the existing 2,400-kilowatt Prosser power plant. The development of this division will entail enlargement of 2 miles of the present power canal and extension of that canal 8 miles to the proposed Chandler power site, and construction of a pumping plant, pipeline across the Yakima River to the main canal, and 43 miles of main canal to reach the main block of irrigable land adjoining the city of Kennewick. Energy produced at the Chandler power plant will be transmitted through facilities to be constructed by the Bonneville Power Administration to assist in relieving the critical power deficiency in the northwest area.

The funds contained in the fiscal year 1952 justification for appropriations will provide for preconstruction studies and investigations to gather pertinent design data necessary for the start of construction. Additional funds in the amount of $1,674,000 would permit the continuation of preconstruction surveys on the main canal and irrigation system; the completion of construction designs, award of contracts, and initiation of construction of the power plant features, the Chandler pumping plant, the Chandler canal, and the first section of the Chandler power canal.

YAKIMA PROJECT, WASHINGTON, ROZA DIVISION, ROZA POWERPLANT

Total estimated cost	$1,856,000
Estimated cost to June 30, 1951	76,228
Planning funds programed, fiscal year 1952	0
Minimum funds required to initiate construction and carry through 1 fiscal year	808,000
Balance to complete	971,772

The plan of development of the Yakima project, Roza division, includes a 10,000 kilowatt power plant for project pumping power which will obviate the necessity of utilizing power from other sources for pumping purposes. This will in effect increase the available hydro power in a seriously deficient power area.

By the end of fiscal year 1951 work will be well advanced on the preparation of final designs and specifications for the Roza power plant. No activity is presently programed for this feature during fiscal year 1952. The availability of $808,000 of additional funds would permit the initiation of construction on this power plant at the beginning of the fiscal year. This would make available 10,000 kilowatts of electrical energy about 1 year in advance of the present schedule and would permit early utilization of $1,000,000 already invested in the main canal.

MISSOURI RIVER BASIN PROJECT, BOSTWICK DIVISION, NEBRASKA-KANSAS, LOVEWELL DAM AND RESERVOIR, PUMPING PLANTS, CANALS, AND LATERALS

Additional funds required to initiate construction and carry through one fiscal year on deferred facilities	$2,444,000

The Lovewell Dam and Reservoir will impound supplemental water for release into the Courtland canal for irrigation use on some 28,000 acres of land. By the end of fiscal year 1951 the assembly of design data and other preconstruction activities will be well advanced. No activity on this feature is contemplated during fiscal year 1952. Additional funds for the Bostwick division in the amount indicated above would provide for the completion of designs and specifications, the award of contracts, and the start of construction on this feature in the latter half of the fiscal year.

Designs are essentially complete for the Franklin South Side pumping plant which will lift water from the Republican River for the irrigation of about 2,100 acres of land. No funds are presently programed for this feature in fiscal year 1952, but with the availability of additional funds, it would be possible to complete the designs and initiate construction on this feature.

The section of the Courtland canal from station 1503 to the Lovewell Reservoir will be required for the delivery of water to some 6,000 acres of land. No construction activity is presently scheduled for this feature during fiscal year 1952, but the availability of the above additional funds would permit the initiation of construction on this section of the canal.

The Franklin South Side canal will deliver water from the Franklin South Side pumping plant to 6,185 acres of new land. The fiscal year 1952 program does not provide for construction of this feature, but with availability of the above additional funds, the designs and specifications could be completed and construction initiated on the first section of this feature.

MISSOURI RIVER BASIN PROJECT, CANNONBALL DIVISION, CANNONBALL UNIT, NORTH DAKOTA

Total estimated cost	$12,695,000
Estimated cost to June 30, 1951	747,721
Planning funds programed, fiscal year 1952	72,053
Minimum funds required to initiate construction and carry through 1 fiscal year	1,628,000
Balance to complete	10,247,226

The Cannonball Dam, the primary feature of the Cannonball unit, is located on the Cannonball River in southwestern North Dakota and will provide flood control along the Cannonball River and storage of irrigation water for 12,500 acres. The land to be irrigated consists of small tracts along the river and water will be distributed by means of the river channel and small electrically driven pumps.

The present program of $72,053 for fiscal year 1952 for this unit will be financed by an estimated unobligated balance of prior year funds. These funds will be utilized for the assembly of design data for all features of the unit and initiation of

work on the preparation of final designs for the Cannonball Dam. The availability of an additional $1,628,000 would permit expediting and completing the preparation of final designs, the award of construction contracts, and the start of construction in the third quarter of fiscal year on the Cannonball Dam.

MISSOURI RIVER BASIN PROJECT, OREGON TRAIL DIVISION, GLENDO UNIT, WYOMING

Total estimated cost	$44,384,000
Estimated cost to June 30, 1951	786,534
Planning funds programed, fiscal year 1952	300,000
Minimum funds required to initiate construction and carry through 1 fiscal year	3,700,000
Balance to complete	39,597,466

The Glendo unit will be located on the North Platte River approximately 6 miles southeast of Glendo, Wyo. Glendo Reservoir with a capacity of 800,000 acre-feet will provide storage for conserving early spring runoff now lost, will alleviate silting problems in Guernsey Reservoir, will permit re-regulation of water from upstream reservoirs for the purpose of generating power at the proposed Alcova and Fremont Canyon plants, and will permit the delivery of a supplemental water supply to 42,640 acres of land. The plan also includes a 24,000-kilowatt power plant at Glendo Dam and a 48,000 kilowatt Fremont power plant, located between the existing Alcova and Pathfinder Reservoirs, which will utilize Glendo Dam for river regulation. These power plants will be of material assistance in meeting a serious shortage of hydro power in this area.

The present fiscal year 1952 program of $300,000 will provide for a continuation of preconstruction surveys and investigations for the collection of design data and for the initiation of work on the preparation of final designs for Glendo Dam and power plant. Additional funds in the amount of $3,700,000 would permit the completion of designs, award of contracts, and initiation of construction in the latter half of the fiscal year on Glendo Dam and power plant, as well as on the temporary Government camp. These funds will also provide for acquisition of necessary rights-of-way and for preparation of repayment arrangements.

MISSOURI RIVER BASIN PROJECT, MISSOURI-SOURIS DIVISION, JAMESTOWN UNIT, NORTH DAKOTA

Total estimated cost	$10,749,000
Estimated cost to June 30, 1951	296,746
Planning funds programed, fiscal year 1952	100,000
Minimum funds required to initiate construction and carry through 1 fiscal year	875,000
Balance to complete	9,477,254

The Jamestown unit is located on the James River in east-central North Dakota. Jamestown Dam, the principal control feature of the unit, is a multipurpose dam which will provide badly needed flood control along the James River and storage capacity for the impoundment of return irrigation flow from the Crosby-Mohall area for diversion to the Jamestown unit lands, as well as 30,000 acres of irrigable land in the Oakes unit. Irrigation water will be delivered to 22,000 acres of Jamestown unit by means of a pumping plant at Jamestown Reservoir and a canal and lateral system. In order to realize the flood-control benefits at an early date, Jamestown Dam is the only feature proposed for construction at this time.

The present fiscal year 1952 program of $100,000 will be financed from unobligated balances of prior year funds. These funds are to be utilized to continue land classification surveys, preparation of preliminary designs and estimates for the irrigation facilities and initiation of work on preparation of final designs for the dam and reservoir, the Government camp, and the access road. With additional funds in the amount of $875,000, it would be possible to complete the designs and specifications, award contracts, and initiate construction on the dam, Government camp, and access road.

MISSOURI RIVER BASIN PROJECT, SOLOMON DIVISION, KIRWIN UNIT, KANSAS

Total estimated cost	$18,155,000
Estimated cost to June 30, 1951	355,000
Planning funds programed, fiscal year 1952	125,000
Minimum funds required to initiate construction and carry through one fiscal year	1,375,000
Balance to complete	16,300,000

Kirwin Dam, the principal feature of the Kirwin unit, will provide flood control along the North Fork of the Solomon River and irrigation water for a minimum of 11,500 acres of land now dry-farmed and subject to frequent droughts. The irrigation distribution system will consist of 45 miles of canals and about 33 miles of laterals.

The present program of $125,000 for fiscal year 1952 will be utilized to continue preconstruction surveys and investigations for the assembly of design data and to prepare final designs for Kirwin Dam and Reservoir. Additional funds in the amount of $1,375,000 would permit the completion of designs, the award of a contract for and the start of construction on Kirwin Dam. A substantial portion of these funds would be used for progress payments on the prime contract and for facilitating services. The remainder of the funds would be used for completion of a temporary 20-unit residence camp for Government personnel, purchase of rights-of-way, and negotiation of a water service and repayment contract with the water users' organization.

MISSOURI RIVER BASIN PROJECT, MARIAS DIVISION, LOWER MARIAS UNIT, MONTANA

Total estimated cost	$64,065,000
Estimated cost to June 30, 1951	2,848,137
Planning funds programed, fiscal year 1952	200,000
Minimum funds required to initiate construction and carry through 1 fiscal year	5,907,000
Balance to complete	55,109,863

The lower Marias unit is located in north-central Montana. Tiber Dam, the principal water conservation and flood-control structure of the unit, will impound the waters of the Marias River for the irrigation of approximately 127,000 acres of dry farm land. Of these 127,000 acres, about two-thirds will be irrigated directly by gravity canals and the remainder will be irrigated by two pumping plants along the main canals. Included in the canals and distribution system for the project lands is a power drop of 1,800 kilowatt capacity, which will be used for seasonal pumping power, and intake and penstock will be constructed in the dam so as to provide for the future installation of a power plant of 2,000 kilowatts. In addition to Tiber Dam, the principal features of the project will include Lonesome Lake Dam and Reservoir; Big Sandy diversion dam; Marias, Kenilfeeder, Kenilgravity, and Sandy Gravity canals; and the lateral system.

The present fiscal year 1952 program of $200,000 will be financed from unobligated balances of prior year funds. These funds will be utilized to complete location surveys and assembly of design data for the first section of the Marias canal and to continue the preliminary studies and investigations on the other irrigation facilities. Additional funds in the amount of $5,907,000 would permit award of a construction contract for and the start of work on Tiber Dam during the early part of fiscal year 1952. Work would also be started on the relocation of existing facilities in the reservoir area, acquisition of necessary right-of-way and the preparation of designs for the first section of Marias canal.

MISSOURI RIVER BASIN PROJECT, MISSOURI-SOURIS DIVISION, MISSOURI DIVERSION UNIT, MONTANA

Total estimated cost	$97,356,000
Estimated cost to June 30, 1951	1,326,455
Planning funds programed, fiscal year 1952	200,000
Minimum funds required to initiate construction and carry through 1 fiscal year	5,087,000
Balance to complete	90,742,545

The plan and development for the Missouri diversion unit contemplates the diversion of water from the Missouri River below Fort Peck by means of a diversion dam, and the transporting of this diverted water to the North Dakota-Montana border by means of the Missouri canal and Medicine Lake Reservoir. This water will be used to irrigate 135,000 acres of land in Montana, including the 91,100 acres of the Missouri diversion unit, as well as 1,108,000 acres of land in North Dakota. The plan of development also contemplates the construction of the 18,000 kilowatt Porcupine power plant and switchyard located on the Missouri canal. In addition, the water will flow in the Des Lacs, Sheyenne, and Red Rivers for the benefit of numerous municipalities and to restore Devils Lake.

The present program of $200,000 for fiscal year 1952, which will be financed from unobligated balances of prior-year funds, will provide for the completion of final designs and specifications for the Missouri diversion dam and the Little Porcupine

power plant and switchyard. These funds will also be used for the assembly of design data on the Missouri canal and for the continuation of topographic surveys and land classification. The availability of an additional $5,087,000 will permit the award of contract for and the initiation of construction on the Missouri diversion dam and the 18,000 kilowatt Little Porcupine power plant and switchyard.

MISSOURI RIVER BASIN PROJECT, SOUTH PLATTE DIVISION, NARROWS UNIT, COLORADO

Total estimated cost	$42, 247, 000
Estimated cost to June 30, 1951	1, 256, 133
Planning funds programed, fiscal year 1952	75, 000
Minimum funds required to initiate construction and carry through 1 fiscal year	1, 875, 000
Balance to complete	39, 040, 867

The Narrows Dam on the South Platte River in northeastern Colorado will provide storage of water with flood control and silt retention benefits for an area of 15,000 square miles. It will conserve return flows from the Colorado-Big Thompson and the potential Blue-South Platte projects, and provide supplemental irrigation for approximately 230,000 acres and full irrigation for approximately 40,000 acres. New lands are to be developed after return flows from the transmountain projects have become stabilized and the water supply proven. Studies are presently being made relative to the hydroelectric power development at the Narrows Dam.

Additional features involved are relocation of approximately 31 miles of the Union Pacific Railroad, diversion of Bijou Creek, relocation of highways and existing irrigation facilities, and construction of a large capacity spillway and outlet works at the dam. Subsequent to completion of the dam and development of the water supply from return flow of the upstream transmountain diversions, distribution systems for new land will be constructed.

The present fiscal year 1952 program of $75,000 will provide for continuation of preconstruction surveys and investigations to assemble design data for all features of the unit and for preparation of plans and specifications for the dam spillway and outlet works. Additional funds in the amount of $1,875,000 would allow the completion of plans and specifications and award of contracts late in the fiscal year for the dam and appurtenant structures and relocation of the railroad, highway and other facilities. All major construction facilities including a substation at the dam site, a shop and laboratory and housing units would be completed.

MISSOURI RIVER BASIN PROJECT, BIG HORN BASIN DIVISION, OWL CREEK UNIT, WYOMING, ANCHOR DAM

Total estimated cost	$2, 856, 000
Estimated cost to June 30, 1951	700, 664
Planning funds programed, fiscal year 1952	0
Minimum funds required to initiate construction and carry through 1 fiscal year	730, 000
Balance to complete	1, 425, 336

The present plan of development of the Owl Creek unit contemplates the initiation of construction in fiscal year 1951 on the pumping plants, canals, and laterals in the Lucerne area for the irrigation of 4,421 acres of the unit. Construction of Anchor Dam and Reservoir which will provide storage space to insure a full water supply for the remaining 12,692 acres has been deferred, and no activity is presently scheduled on this feature in fiscal year 1952.

However, the designs for Anchor Dam are substantially complete at the present time, and with an additional $730,000 for fiscal year 1952, it would be possible to initiate construction on this feature at the beginning of the fiscal year with the result that water would be available to the remaining acreage 1 year in advance of the present schedule.

MISSOURI RIVER BASIN PROJECT, MIDDLE LOUP DIVISION, SARGENT UNIT, NEBRASKA

Total estimated cost	$10, 671, 000
Estimate cost to June 30, 1951	700, 420
Planning funds programed, fiscal year 1952	131, 400
Minimum funds required to initiate construction and carry through 1 fiscal year	1, 227, 000
Balance to complete	8, 612, 120

The Sargent unit includes features for the irrigation of about 16,340 acres of land located for the most part in the Middle Loup River Valley in Custer and Valley Counties, Nebr. The plan of development also includes a hydroelectric plant having an installed capacity of 3,320 kilowatts. The development of this unit will necessitate the construction of the Milburn diversion dam, Sargent and Lillian canals and laterals, and the Lillian hydroelectric power plant.

The present program of $131,400 will be financed from an unobligated balance of prior-year funds and will be utilized for the preparation of designs and specifications for the Milburn diversion dam, Sargent canals and laterals, and the Government camp at Sargent, Nebr. The availability of $1,227,000 of additional funds will permit the completion of designs and specifications and the initiation of construction on these features in the latter half of fiscal year 1952.

MISSOURI RIVER BASIN PROJECT, GRAND DIVISION, SHADEHILL UNIT, SOUTH DAKOTA

IRRIGATION FACILITIES

Total estimated cost	$3,019,000
Estimated cost to June 30, 1951	295,715
Planning funds programed, fiscal year 1952	419,176
Minimum funds required to initiate construction and carry through 1 fiscal year	315,000
Balance to complete	1,989,109

Shadehill Dam, presently under construction, is the principal control structure on the Shadehill Unit and will provide 311,000 acre-feet of storage capacity for flood control along the Grand River, silt control for Grand River and Oahe Reservoir, and the irrigation of 12,000 acres of land along the north side of the river. Water will be delivered to the land by means of a 29.5-mile main canal, eight pumping plants, and a lateral system.

The remaining minor items of work on Shadehill Dam and Reservoir will be completed in fiscal year 1952 and funds in the amount of $419,176 are being requested during that fiscal year for continuation of field surveys and investigations required for the assembly of design data for the unit pumping plants, canals, laterals, and drains. With the availability of additional funds in the amount of $315,000, collection of design data for the pumping plants, canals, laterals, and distribution lines and substations to serve the pumping plant would be completed, final designs prepared, and actual construction initiated on these features in the latter part of the fiscal year. This expedited program would permit the initial delivery of water to be made one year in advance of the present schedule and would provide for early utilization of $7,896,000 investment in Shadehill Dam for irrigation purposes.

MISSOURI RIVER BASIN PROJECT, LOWER BIG HORN DIVISION, YELLOWTAIL UNIT, MONTANA

Total estimated cost	$99,640,000
Estimated cost to June 30, 1951	2,482,240
Planning funds programed, fiscal year 1952	100,000
Minimum funds required to initiate construction and carry through 1 fiscal year	6,712,000
Balance to complete	90,345,760

The proposed Yellowtail Dam and power plant will be located on the mouth of the Big Horn Canyon about 45 miles southwest of Hardin, Mont. The 200,000-kilowatt Yellowtal power plant is urgently needed for further development in the area, and the construction of the unit is virtually indispensable to the development of approximately 44,000 acres of new land in the Hardin unit which will be provided with a water supply by pumping directly from the Big Horn River below Yellowtail Dam, and it is also essential to improve and regulate the water supply for 20 other proposed units located along Yellowstone River. Furthermore, the feasibility of these other units as well as the number of desirable pumping units along the Yellowstone, Tongue, and Powder Rivers is dependent upon the availability of low-cost power for pumping such as will be provided by the Yellowtail power plant. Several other pumping units along the Big Horn River in Wyoming will also be dependent on this source of power as the output of the Boysen power plant is absorbed by closer markets. In addition to these benefits the Yellowtail Reservoir will provide badly needed flood control along the Big Horn River.

The present program of $100,000 for fiscal year 1952 will be financed from unobligated balances of prior-year funds and will consist of the initiation of work on the preparation of designs and specifications for the dam, power plant, switchyard, and appurtenant structures. The availability of an additional $6,712,000 would provide for expediting the preparation of detailed designs and specifications for these structures in order to permit the initiation of construction in the early part of fiscal year 1952.

The CHAIRMAN. I am particularly hopeful—perhaps Mr. Nelson will touch on it—that we may see the part that reclamation is playing in food production. We have a lot of extra hungry mouths to feed—perhaps 2 millions annually—and all that sort of thing, that we may need to see that relationship, I think.

Mr. Nelson.

STATEMENT OF ASSISTANT COMMISSIONER OF RECLAMATION NELSON

Mr. NELSON. Mr. Chairman and members of the committee, in response to the request contained in your letter of January 26, we have submitted to you certain information, extra copies of which have been made available to members of the committee this morning. The bulk of the material, and the reason for the bulk, is because the investigation program has been broken down into the programs for the various States and there are duplications by reason of basin concepts and the interest of one State in projects located in another.

Mr. D'EWART. Might I ask a question or two?

The CHAIRMAN. Yes, Mr. D'Ewart.

Mr. D'EWART. In presenting this data, why didn't you include, for instance, in the Columbia and the Missouri Basins those accounts? For instance, Nebraska shows zero the first sheet right straight across. We know it does get some Missouri Basin funds.

Mr. NELSON. Yes.

Mr. D'EWART. In other words, why is it presented this way, instead of giving the total picture?

Mr. NELSON. The Missouri Basin project is an authorized project, but broken down into three phases, A, B, and C—and there are others as well, phase A being construction, phase B advance planning, and phase C investigations. The material was eliminated from this information we presented for that particular reason.

However, I think in order to give the view of the investigation program in its entirety it would be desirable to submit the material on the Missouri River Basin also and I shall plan to do so.

(The material is as follows:)

Missouri River Basin project, program of phase B investigations, fiscal years 1951–52

SUMMARY

State	Estimated, fiscal year 1951	Expenditures fiscal year 1952
Kansas	0	$125,000
Montana	$742,334	729,321
Nebraska	891,000	500,000
North Dakota	956,086	716,000
South Dakota	992,947	1,078,000
Wyoming	789,136	550,000
Total	4,371,503	3,698,321

Missouri River Basin project, program of phase B investigations, fiscal years 1951–52—Continued

KANSAS

State	Estimated, fiscal year 1951	Expenditures, fiscal year 1952
Kirwin unit, total phase B	0	$125,000

MONTANA

Helena Valley unit	$75,596	$50,000
East Bench unit	146,254	140,000
Hardin unit	242,686	300,000
Charley Creek unit	30,000	20,000
Nickwall unit	12,776	14,000
Colgate unit	40,000	20,000
Elm Coulee unit	45,000	18,000
Seven Sisters unit	30,000	25,000
Stipek unit	75,000	50,000
Marsh unit	5,022	0
Moorhead unit	40,000	92,321
Total	742,334	729,321

NEBRASKA

Farwell unit	$391,600	$368,600
Sargent unit	350,200	131,400
Lower North Loup unit	149,200	0
Total	891,000	500,000

NORTH DAKOTA

Crosby-Mohall unit	$828,230	$654,000
Devils Lake unit	49,756	25,000
Hancock Flats unit	38,500	0
Painted Woods unit	21,600	37,000
Square Butte unit	18,000	0
Total	956,086	716,000

SOUTH DAKOTA

Rapid Valley unit	$180,000	$200,000
Oahe unit	786,240	878,000
Pine Ridge unit	26,707	0
Total	992,947	1,078,000

WYOMING

Bighorn No. 2 unit	$39,000	$15,000
Bighorn No. 3 unit	24,000	14,000
Bluff unit	21,000	10,000
Hanover unit	25,081	15,000
Paintrock unit	0	20,000
Shell Creek unit	30,000	26,000
Shoshone extensions unit	270,014	250,000
Kaycee unit	200,166	125,000
Piney unit	179,875	75,000
Total	789,136	550,000

Missouri River Basin Project—Program of phase C investigation by States, fiscal years 1951 and 1952

State	Programed expenditures, fiscal year 1951			Estimated expenditures, fiscal year 1952		
	Wholly within the State	Partly within the State [1]	Total	Wholly within the State	Partly within the State [1]	Total
Colorado		$1,011,000	$1,011,000		$745,000	$745,000
Kansas	$20,000	474,000	494,000	$35,000	260,000	295,000
Montana	701,000	1,093,000	1,794,000	608,000	702,000	1,310,000
Nebraska	860,000	1,221,000	2,081,000	680,000	795,000	1,475,000
North Dakota	195,000	820,000	1,015,000	135,000	340,000	475,000
South Dakota	196,000	1,073,000	1,269,000	103,000	390,000	493,000
Wyoming	507,000	1,878,000	2,385,000	465,000	1,337,000	1,802,000
Subtotal	2,479,000	7,570,000	10,049,000	2,026,000	4,569,000	6,595,000
Less unliquidated obligations, etc., included above			−225,000			
Less adjustment for duplications [1]			−5,229,000			−3,095,000
Grand total, phase C			4,595,000			3,500,000

[1] In each case the estimated expenditures shown for multi-State investigations, "partly within the State" are the total amounts to be spent on these investigations in all of the States involved which necessitates an adjustment as shown to correct for the duplications.

Missouri River Basin project—program of phase C investigations, fiscal years 1951–52

COLORADO

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State	None	None
Multi-State investigations partly within the State: [2]		
North Platte River Basin, Wyo., Colo., Nebr.	$282,000	$135,000
South Platte River Basin, Colo., Wyo., Nebr.	255,000	250,000
Kansas River Basin, Nebr., Kans., Colo.	289,000	260,000
Missouri River Basin general, region 7, Colorado, Kansas, Nebraska, South Dakota, Wyoming	79,000	
Interior Missouri Basin field committee, Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming	106,000	100,000
Total, partly within the State	1,011,000	745,000
Grand total	1,011,000	745,000

[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

KANSAS

Investigations wholly within the State: Webster unit, Solomon division	$20,000	$35,000
Multi-State investigations partly within the State: [2]		
Kansas River Basin, Nebr., Kans., Colo.	289,000	260,000
Missouri River Basin general, region 7, Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming	79,000	
Interior Missouri Basin field committee, Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming	106,000	
Total multi-State partly within the State	474,000	260,000
Grand total	494,000	295,000

[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Missouri River Basin project—program of phase C investigations, fiscal years 1951–52—Continued

MONTANA

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Lower Big Horn division	$85,000	$95,000
Clarke Fork division, Montana	65,000	95,000
Helena-Great Falls division	77,000	90,000
Jefferson division	140,000	103,000
Judith division	15,000	
Marias division	50,000	30,000
Milk division	17,000	
Montana pumping division	41,000	30,000
Musselshell division	10,000	
Sun-Teton division	60,000	55,000
Sweetgrass division	500	
Three Forks division	140,000	110,000
Shields division	500	
Total, wholly within the State	701,000	608,000
Multi-State investigations partly within the State:[1]		
Little Missouri division, Montana, North Dakota, South Dakota, Wyoming	51,000	
Missouri-Souris division, Montana, North Dakota, South Dakota	224,000	85,000
Powder division, Montana, Wyoming	241,000	220,000
Tongue division, Montana, Wyoming	84,000	164,000
Yellowstone division, Montana, North Dakota	119,000	25,000
Interior Missouri Basin field committee, Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming	106,000	100,000
Power system planning, region 6, Montana, North Dakota, South Dakota, Wyoming	173,000	58,000
Cooperative planning surveys, region 6, Montana, North Dakota, South Dakota, Wyoming	95,000	50,000
Total multi-State partly within the State	1,093,000	702,000
Grand total	1,794,000	1,310,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

NEBRASKA

Investigations wholly within the State:		
Lower Platte River Basin	$162,000	$22,000
Ainsworth unit, Sandhills division	100,000	150,000
Benkelman unit, upper Republican division	10,000	30,000
Columbus division	55,000	320,000
Grand Island division	125,000	
North Loup division	399,000	40,000
O'Neill unit, lower Niobrara division		100,000
Power market studies, Nebraska	9,000	18,000
Total wholly within the State	860,000	680,000
Multi-State investigations partly within the State:[2]		
Kansas River Basin, Nebr., Kans., Colo	289,000	260,000
Niobrara River Basin, Nebr., S. Dak., Wyo	210,000	50,000
North Platte River Basin, Wyo., Colo., Nebr	282,000	135,000
South Platte River Basin, Colo., Wyo., Nebr	255,000	250,000
Missouri River Basin general, region 7, Colorado, Kansas, Nebraska, South Dakota, Wyoming	79,000	
Interior Missouri Basin field committee, Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming	106,000	100,000
Total multi-State partly within State	1,221,000	795,000
Grand total	2,081,000	1,475,000

[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Missouri River Basin project—program of phase C investigations, fiscal years 1951–52—Continued

NORTH DAKOTA

Investigations	Estimated expenditures	
	Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Cannonball division	$51,000	
Garrison division	99,000	$132,000
Knife division	18,000	
North Dakota pumping division	27,000	3,000
Total wholly within the State	195,000	135,000
Multi-State investigations partly within the State: [1]		
Little Missouri division, North Dakota, Montana, South Dakota, Wyoming	51,000	
Missouri-Souris division, Montana, North Dakota, South Dakota	224,000	85,000
Yellowstone division, Montana, North Dakota	119,000	25,000
Interior Missouri Basin field committee, Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming	106,000	100,000
Cooperative planning surveys, region 6, Montana, North Dakota, South Dakota, Wyoming	95,000	50,000
Power system planning, region 6, Montana, North Dakota, South Dakota, Wyoming	173,000	58,000
Grand division, South Dakota, North Dakota	52,000	22,000
Total multi-State partly within the State	820,000	340,000
Grand total	1,015,000	475,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

SOUTH DAKOTA

Investigations wholly within the State:		
Bad division	$1,000	
James division	66,000	$74,000
Moreau division	23,000	
South Dakota pumping division	12,000	20,000
White division	94,000	9,000
Total wholly within the State	196,000	103,000
Multi-State investigations partly within the State: [2]		
Grand division, South Dakota, North Dakota	52,000	22,000
Cheyenne division, South Dakota, Wyoming	83,000	25,000
Niobrara River Basin, Nebr., S. Dak., Wyo	210,000	50,000
Little Missouri division, Montana, North Dakota, South Dakota, Wyoming	51,000	
Missouri-Souris division, Montana, North Dakota, South Dakota	224,000	85,000
Missouri River basin, general, region 7, Colo., Kans., Nebr., S. Dak., Wyo	79,000	
Interior Missouri Basin field committee, Colorado, Kansas, Montana, Nebraska, North Dakota, South Sakota, Wyoming	106,000	100,000
Cooperative planning surveys, region 6, Montana, North Dakota, South Dakota, Wyoming	95,000	50,000
Power system planning, region 6, Montana, North Dakota, South Dakota, Wyoming	173,000	58,000
Total multi-State partly within the State	1,073,000	390,000
Grand total	1,269,000	493,000

[2] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Missouri River Basin project—program of phase C investigations, fiscal years 1951–52—Continued

WYOMING

Investigations	Estimated expenditures— Fiscal year 1951	Fiscal year 1952
Investigations wholly within the State:		
Fremont Canyon power plant		$90,000
Clarks Fork division, Wyoming	$154,000	190,000
Big Horn Basin division	85,000	50,000
Wind division	218,000	135,000
LaPrele unit, Oregon Trail division	50,000	
Total, wholly within the State	507,000	465,000
Multi-State investigations partly within the State: [1]		
Cheyenne division, South Dakota, Wyoming	83,000	25,000
Clarks Fork division, Wyoming, Montana	219,000	285,000
Little Missouri division, Montana, North Dakota, South Dakota, Wyoming	51,000	
Powder division, Wyoming, Montana	241,000	220,000
Tongue division, Wyoming, Montana	84,000	164,000
Niobrara River Basin, Nebr., S. Dak., Wyo	210,000	50,000
North Platte River Basin, Wyo., Colo., Nebr	282,000	135,000
South Platte River Basin, Colo., Wyo., Nebr	255,000	250,000
Missouri River Basin general, region 7, Colorado, Kansas, Nebraska, South Dakota, Wyoming	79,000	
Interior Missouri Basin field committee, Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming	106,000	100,000
Cooperative planning surveys, region 6, Montana, North Dakota, South Dakota, Wyoming	95,000	50,000
Power system planning, region 6, Montana, North Dakota, South Dakota, Wyoming	173,000	58,000
Total multi-State partly within State	1,878,000	1,337,000
Grand total	2,385,000	1,802,000

[1] The estimated expenditures shown for multi-State investigations are the total amounts to be spent on the investigations in all of the States involved.

Mr. MILLER. It doesn't mean, then, that when you show Nebraska as zero all the way across you are not going on with the surveys that you have already started with on the Niobrara and the Loup River Basin; is that correct?

Mr. NELSON. That is correct, Congressman Miller.

Mr. MILLER. I mean that you are going on with them.

Mr. NELSON. Yes, sir. The reason it does show that way is because the money was obtained from the Missouri River funds.

Mr. MILLER. Yes.

Mr. NELSON. The data which we have submitted first under "Investigations" is an over-all summary of the investigation program for all the 17 Western States excluding the Missouri River Basin.

Then there is a 1- or 2-page summary for each State of the investigation program. And, finally, under the "Investigations" portion which you requested there is a description and location of each investigation in the fiscal years 1951 and 1952 compiled separately for each State.

Additional information is as follows: The projects for which investigations have progressed to the stage of drilling and the final detailed surveys, all of those are unauthorized projects, except the Canadian River project which was recently authorized.

Mr. ENGLE. Mr. Nelson—

Mr. NELSON. Yes.

Mr. ENGLE. You have indicated in this investigation the united western investigation. Can you tell me what the status of that is?

Mr. NELSON. The report on the United Western reconnaissance has been submitted to the Commissioner's office and at the present time is being considered within the Department prior to the submitting of it, with the approval of the Department, to interested parties, which would be the States of interest and many others.

Mr. ENGLE. As I understand, your report, so far as the Bureau is concerned, is in final form. That is, you are submitting it now—is it at staff level in the Department yet?

Mr. NELSON. Yes, sir.

Mr. ENGLE. In other words, it is up on the Secretary's desk?

Mr. NELSON. It is being considered by the Department. I am not certain whether it is on the Secretary's desk.

Mr. ENGLE. It is out of the Bureau and over in the Department?

Mr. NELSON. Yes, sir.

Mr. ENGLE. And in that you have made some specific findings with reference to this so-called great western development; is that right?

Mr. NELSON. We have made a reconnaissance analysis of the problem of bringing water from streams in the northern part of California, and even have investigated the availability of water in Oregon and Washington, to determine to what extent water could be taken from those streams and diverted into California. The studies even considered the extension at one time of a canal into the Imperial Valley.

A plan is presented in this reconnaissance report, not necessarily the best or only plan, and based on that particular plan there are certain conclusions made as to the water available, the water needs, and the over-all economics. A very interesting report, I should say.

Mr. ENGLE. What is the purpose of this investigation? It overlaps, does it not, the basin-wide study, for instance, on the Columbia and its tributaries?

Mr. NELSON. I don't believe, Congressman, it overlaps. However, any survey of this kind involving more than one basin obviously will show certain factors which will have a bearing on the development of those basins.

For example, water taken from rivers in the north and brought down through California, obviously would have a bearing on the present Central Valley project. Water taken further south to Los Angeles would have a bearing on the works already constructed, such as those which take the water for municipal purposes from the Colorado and from Owens Valley. So when a comprehensive over-all survey of this kind is prepared, it has a bearing on not only the areas which it covers, but also on diversions from neighboring streams, such as the Colorado.

Does that answer the question for you?

Mr. ENGLE. Yes, sir; it does. It also confirms my suspicions.

Now, will you answer one further question: Do you intend to circulate this report in the manner required by the Flood Control Act of 1944?

Mr. NELSON. Yes, indeed; after the Secretary approves it will be circulated to the States and to Members of Congress.

Mr. ENGLE. Thank you very much.

Mr. MILLER. I would like to ask another question there. I don't want to take too much time.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. I don't quite understand this Bureau of Reclamation program of general investigation by States. It includes reclamation funds, Colorado River development funds, and general funds, for fiscal year 1951–52. Taking my own State of Nebraska, your program expenditures for the fiscal year 1951 and your estimated expenditures to fiscal year 1952, wholly within the State or partly within the State——

Mr. NELSON. Yes, sir.

Mr. MILLER. Now, I am not clear as to what this schedule is supposed to show. I do know that in Nebraska you have a large office at Grand Island. You have another one in the northern part of the State. They are making some surveys and reports to the Reclamation Bureau in Denver and here in Washington. Yet, it shows no program of expenditures for 1951 or 1952.

Mr. NELSON. The reason for that, sir——

Mr. MILLER. That doesn't give a clear picture, to me, of what the Reclamation people are trying to do, because it doesn't show here. I know you have quite a large office, force of men, at these two areas at least working and doing a splendid job by the way.

Mr. NELSON. Yes.

Mr. MILLER. Where do they get the money on the "Reclamation" funds?

Mr. NELSON. It comes from funds available for the Missouri River Basin. You will note in the heading that this report is only for the reclamation fund, the Colorado River development fund, and the general fund, exclusive of——

Mr. MILLER. Then you have some funds at river basins, like the "Missouri River Basin" funds, that are not shown?

Mr. NELSON. Yes, indeed.

Mr. MILLER. In this report?

Mr. NELSON. Yes.

Mr. MILLER. Will that be shown later on as to what you get out of those "Missouri River Basin" funds, for instance, for the Dakotas and Nebraska?

Mr. NELSON. I am planning to submit that information for the record, and this particular table probably should be revised to show also the "Missouri River Basin" funds.

Mr. MILLER. We should have a clearer picture, at least to me, whether it is by the Army Engineers or the Reclamation Bureau. It has to be shown some place here as part of the picture.

Mr. NELSON. Yes, sir. Another item which you asked for, Mr. Chairman, was those projects which have been recommended for authorization or which will be submitted to the Secretary of the Interior shortly with recommendations for authorization. That list is also included.

Finally, you gave us a list of projects on which you requested certain data. Those were the authorized projects which were not included in the immediate construction program. This information is provided.

Now, the information which you requested, Mr. Chairman, refers to the immediate program of reclamation. This, in my opinion, should be tied into the long-term program and related to the 6-year program which has been submitted to you previously, the last one being in 1948 as mentioned by Assistant Commissioner Lineweaver.

Furthermore, in order to assess correctly the place of the reclamation program we all need to know the over-all relation of that program to the economy of the Nation and the economy of the West based on the most recent and available data. However, we are especially concerned with the part the program will play for food production, hydroelectric energy, domestic, municipal, and industrial water supply in the defense program. With these things in mind, I hope the committee will give consideration in the course of the hearings—I understand there are other witnesses—to such items as those I am going to enumerate.

The first of these is the accomplishments of the Bureau of Reclamation to date in the fields of irrigation, power development, municipal and industrial water supply and drainage, including such items as the lands irrigated, the hydroelectric energy installed, the miscellaneous water supplies that have been made available, the total investment, the reimbursement, the crop returns, and indirect benefits. Mr. Lineweaver mentioned that much of that material was being submitted.

Second, the quantity of land which can be developed in the West through irrigation and drainage, and the hydroelectric energy which can be produced and the municipal and industrial water which can be supplied under reasonable and economic justification. Then the quantity of farm lands which are available for the production of crops and the acreage of land which is producing crops for the Nation as a whole and for the 17 Western States. And that should be compared over a period starting, let's say, in 1910 to locate the trends. Another item needs, I think, to be considered in this over-all question, and that is the population of the Nation and the 17 Western States in 1950, and again to watch the trend for the previous 10-year periods going back to 1910, and perhaps to make a forecast for the next 40 years on the best forecast that can be made.

Also, it would be desirable to note the changes in population in counties, for example, where irrigation is practiced compared to surrounding dry farm areas.

Another thing which would be very important in this over-all consideration of the need for food, which you mentioned previously, is the dollar values and the general kinds of agricultural products which were exported and imported from 1910 to 1950. And I think the data for the latest year for which information is available should be in considerable detail because the value of crops has a relation to the dollar as well as the tonnage of produce, and then given in less detail for the previous years to show again this trend which we should be very much concerned about.

Then I think we need some data on the surplus-crops situation for the last several years, with particular reference to the storage and the use from storage for domestic and foreign purposes of such crops as wheat and cotton and so forth.

And finally, an analysis should be made of all those data in relation to trends and population increase, industrial expansion, requirements for food and fiber, and the needs for domestic municipal and industrial use of water and demands for hydroelectric power.

I hope that much of this information will be developed by the witnesses who follow.

I understand that Dr. John Lee Coulter, who has made several studies of this type, is going to speak to you. I think that is the kind

of analysis that needs to be made, not only to consider the long-term view, but also what is immedittely before us.

As an example, the acreage of wheat has been greatly increased in the last several years by plowing up the pastures in the Middle West and elsewhere. That type of development, as you know, is extremely vulnerable to changes in climatic conditions. If there is a drought in the area, then the food supply of the Nation may be seriously affected and quickly. Of course, a drought also brings with it a tremendous soil waste in places like that where it is not possible to control adequately the wind erosion through the application of irrigation water.

That concludes my general statement, Mr. Chairman. I think by following through on the line you have now started we may, and I hope we can, get some answers to some of these questions I have raised.

The CHAIRMAN. Yes, sir. Well, that is a good start. We probably have some questions we would like to ask. I did want to hear—our time is getting away. We have with us the executive secretary of the National Reclamation Association. Are you prepared, Mr. Welsh?

Mr. WELSH. Yes, sir.

The CHAIRMAN. Were there any questions you would like to ask of Mr. Nelson before he gets away?

Mr. REGAN. I would, Mr. Chairman.

The CHAIRMAN. Mr. Regan.

Mr. REGAN. This schedule on top of your file, investigations that were chosen, totals about $15,000,000 of expenditures and yet your budget called for $220,000,000. Where do we get the information on how the other $206,000,000 is allocated for power and reclamation projects?

Mr. NELSON. That material has been, of course, prepared for submission to the Appropriations Committee. It is also available in general terms in the President's budget.

Mr. REGAN. Those are all items that have been heretofore authorized?

Mr. NELSON. Yes, sir. I think it would be possible for us to give the breakdown, if you wish.

Mr. REGAN. I don't know if the chairman would like to have it or not. But I was just looking over this. It doesn't give very much information.

Mr. NELSON. No, sir; not on that subject.

Mr. REGAN. I was just wondering where the $206,000,000 was being spent.

Mr. NELSON. I think the first material which Mr. Lineweaver mentioned as being presented to the committee will contain that data which you asked for—the breakdown of the other money.

Mr. REGAN. It is possible the Committee on Appropriations may reduce that $221,000,000?

Mr. NELSON. Yes, sir.

Mr. REGAN. I would like to ask one more question, if I may, Mr. Chairman. Mr. Lineweaver started off by talking about the Magna Carta of the reclamation in 1902 and everything follows through from that. Do we have any easy information on the amount of money that has been spent in the 17 States on irrigation projects and the amount that has been repaid to the Government by the farmers and the people who have benefited from those expenditures?

Mr. NELSON. Yes; we do have the information.

Mr. LINEWEAVER. We will be glad to submit that for the record, Mr. Regan.

Mr. NELSON. I can give you the figures roughly, but to be exact I think they should be submitted for the record.

Mr. NELSON. The information requested by Mr. Regan is contained in the following tabulation:

1. Total expenditures to June 30, 1950, from all appropriations, allotments, and emergency funds, excluding trust funds	$1, 982, 350, 803
(a) Expenditures, 1902–40	725, 237, 186
(b) Expenditures, 1941–50	1, 257, 113, 617
(c) Total expenditures for completed projects only	246, 378, 477
2. Amounts returned to Federal Treasury to June 30, 1950:	
(a) From irrigation repayment	88, 739, 714
(b) From power revenues	233, 616, 369
Total	322, 356, 083
3. Gross crop returns from irrigation under Federal reclamation projects:	
(a) Total to Jan. 1, 1950	6, 583, 569, 996
(b) Estimate for calendar year 1950	543, 682, 520
4. Gross power revenue from sales by Bureau of Reclamation:	
(a) Total to June 30, 1950	233, 616, 369
(b) For fiscal year 1950	36, 361, 663
5. Total number of reclamation projects, or major divisions of projects:	
(a) Now being operated by Bureau or water users associations	65
(b) Now under construction	[1] 53
(c) Authorized, but not yet under construction	7

[1] Includes Missouri River Basin project as 1 project, 16 units or divisions of which are not under construction.

Mr. REGAN. It would be very interesting to have that.

Mr. MILLER. Will the gentleman yield? Will you have the benefit of the new crops brought in, so Uncle Sam will have some taxes to run the Government?

Mr. NELSON. We shall submit that material.

Mr. REGAN. It is very worth-while information.

The CHAIRMAN. Thank you.

The National Reclamation Association represents the dirt farmer. While we are pretty well acquainted with it, we are glad to have with us this morning Mr. Welsh, who will give us his views. I had received a letter a few days ago, and I think all members did, from Mr. Welsh, and I was deeply impressed with it, Mr. Welsh. I think I called your attention to one paragraph in which you stressed the need of food, that caused me to ask the question a little earlier this morning. I hope you hit on that in the prepared statement.

STATEMENT OF WILLIAM E. WELSH, SECRETARY-MANAGER, NATIONAL RECLAMATION ASSOCIATION

Mr. WELSH. Thank you, Mr. Chairman.

I do have a prepared statement which I would appreciate the opportunity of reading to the committee, Mr. Chairman.

I appreciate the invitation which has been extended to me by the chairman of this committee to appear here today as secretary-manager

of the National Reclamation Association in support of a program for reclamation development in the West.

The National Reclamation Association was created at a time when many westerners were fearful that we might lose our entire reclamation program. It was created for the express purpose of "saving reclamation." Our association is a voluntary one which represents the 17 Western States—the western half of the United States.

As an indication of the deep convictions of the members of our association for the need for further reclamation development, I would like to quote to you from the constitution of our association.

Now, with your permission, Mr. Chairman, I would like to omit the reading of that quotation. I think you are all familiar with it, but I would appreciate it if it might be included in my remarks in the record.

The CHAIRMAN. Yes, it will be included.

(The resolution referred to is as follows:)

SEC. 3. The purposes of the association shall be to promote the development, control, conservation, preservation, and utilization of the water resources of the reclamation States, to work for the continuation of the services and the coordination of the activities of the presently existing Federal agencies dealing with these water resources, to cooperate with and assist such agencies in securing prompt authorization and construction of those Federal projects which meet with the approval of the State and localities affected, to assist the reclamation States and water users thereof in the economic development and operation of water improvements and integration of their activities with existing Federal agencies, to preserve the rights and interests of the reclamation States in their water resources, and to promote the adoption of legislation in furtherance of, and to oppose legislation detrimental to these purposes.

Mr. ENGLE. Mr. Welsh, relative to this resolution, if I may stop you right there——

Mr. WELSH. Sir?

Mr. ENGLE. I notice in the second paragraph you refer, of the resolution on page 3, to—

support for such legislation as, consistent with the acquisition and preservation of rights in water under State law and with the preservation of the integrity of the laws of the 17 Western States in this field, will tend to relieve water and power users of the financial burden of costs properly allocable to broad national purposes—

and so forth.

Are you implying in that resolution there is some question of whether or not State laws are going to be recognized?

Mr. WELSH. I wouldn't say as to that. But I would say it has been one of the primary concerns of the National Reclamation Association from the time it was first organized that full recognition should be given to western State water laws. That is a reiteration of the principle which was approved and has been one of the cardinal principles of the association down through the years, 19 years now.

Mr. ENGLE. Well, this committee certainly is in accord with it as far as I know.

Mr. WELSH. I think that is right; yes, sir.

Mr. ENGLE. The Gerlach case in California, it seems to me, settled that proposition very definitely. It went to the Supreme Court last summer.

Mr. WELSH. Yes, sir.

Mr. ENGLE. It came out of the Supreme Court. Have you ever made any investigation of what water rights exist under Army engineers construction?

Mr. WELSH. I haven't made a thorough investigation of it, no, sir.

Mr. ENGLE. Are you familiar with the TVA authorities on that subject? I understand that the courts held in the TVA that water rights under a project were subservient to the water regulation and usage controlled by the Federal Goverment on a flood-control project built under the commerce clause of the Constitution; is that right?

Mr. WELSH. I am not sure of that. I don't know.

Mr. ENGLE. I think it is a matter that the National Reclamation Association ought to take a look at.

The CHAIRMAN. That is a very important question and I think the committee ought to look into it further. Perhaps the present witness is unable to do so, but we will look into that further.

Mr. WELSH. I haven't gone into that recently, Mr. Chairman, particularly with respect to development under the Army engineers. Congressman Engle referred to development through the TVA procedure. I do know that our association has been on record for a period of 10 years as opposing valley authorities and that was one of the primary reasons for opposing it—because of the fear of losing control and jurisdiction over the water rights under that procedure.

Mr. ENGLE. A lot of States don't have a law properly applicable to the disposition of the water rights on water subject to Federal reclamation projects.

As an illustration, in the Central Valley of California—I want to find out one of these days just how those water rights are going to be acquired. If the Bureau of Reclamation, by controlling the point of diversion and the amounts diverted from the main canals of a reclamation project, can in effect establish water rights, maybe we better do something about it.

In California, and I suspect it is more or less true throughout the whole West, water rights are acquired by beneficial consumptive use. That is the way we acquire them in California.

Mr. WELSH. Under State law?

Mr. ENGLE. That is right.

Mr. WELSH. Yes, sir.

Mr. ENGLE. But let's assume that the Bureau of Reclamation runs a great big long canal down the Sacramento Valley or the San Joaquin Valley and by contracts it makes with the irrigation districts it controls the point of diversion and the amounts diverted.

Doesn't it in effect then control the acquisition of water rights based on the beneficial consumptive use?

Mr. WELSH. Well, that might be true in a development on such a scale as the Central Valley project in California. I am not too familiar with that. In the region where I was engaged in irrigation and reclamation work before I came down here, in Idaho and the Pacific Northwest, the Bureau of Reclamation up there always acquired a water right as far as I know in the same manner as any individual or any private company, by filing on that water under State law.

Mr. ENGLE. The Bureau of Reclamation took the filing from the State of California on certain waters of the Sacramento River. We gave it to them. Then they turned around and they ran that water 125 miles or whatever it is down the San Joaquin Valley. What I am

trying to figure out is how the spreading of that water is going to be handled and how the water rights in that water are going to be acquired over a period of time.

Now, just assuming that it is to be done under State law. I have grave doubts whether or not there is any State law which can really be applied with logic to that kind of situation, for the simple reason the State laws weren't set up to handle the flows of rivers which are diverted by human hands. And after you see this great western report we have been talking about here in which the rivers are going to be running backwards and uphill and downwards and crossways and the whole scheme of nature is going to be altered even in huge watersheds, maybe we better start giving some thought as to how we are going to acquire these water rights. And after the water has started to run, whether the water rights do vest. I didn't intend to divert you from your statement.

Mr. WELSH. That is all right, sir.

Mr. ENGLE. But it is a good subject matter of inquiry, it seems to me, of an association which has concerned itself with western reclamation over a number of years and which has always stood firmly, as I understand, on the proposition that water rights under the reclamation law are to be acquired subject to State law.

Mr. WELSH. I think that is very pertinent. I can see that that question will become more and more important, especially as we begin to consider the diversion of water from one watershed to another. Heretofore, our diversions have been within a watershed or within a river basin and where there are several States involved, one of the procedures which is being given a lot of consideration and favorable consideration is that of interstate compacts, in which the States agree among themselves as to the allocation of waters within the basin. But that doesn't solve the question of diverting it from one basin to another. I will agree with you.

Mr. ENGLE. Not only that, it doesn't solve the question of controlling the diversions on the main canals because by controlling the diversions on the main canal the Federal Government through the Bureau of Reclamation can in effect control the acquisition of water rights based on a system of beneficial consumptive use.

Mr. WELSH. That is right.

The CHAIRMAN. If I may add just there, the gentleman from California is exactly right about the importance of this. It is a mighty pertinent matter. However, it may be that California will have to do some more legislating. California has been legislating in such matters for a long time. It seems to me that the Wright Act was passed in 1884.

Now, so far as I know, the Wright Act in California was their first. It may not be the first, but——

Mr. D'EWART. If the chairman will yield, I hope he didn't indicate when he said the gentleman from California was entirely right that his conclusions were right.

The CHAIRMAN. No, I didn't mean that. I meant that he is right concerning the importance of this matter.

Mr. ENGLE. But I will say to the gentleman that I haven't drawn my conclusions. I have been thinking about it a little. And the reason it is important to this committee, Mr. Chairman, is because assuming that additional State legislation is needed in California and

elsewhere throughout the West, I suspect that we may have something to do with it for the simple reason that I believe that the Bureau can, in effect, control the acquisition of water rights by controlling the points and the amounts of diversion from the main canals.

Now, if that is true, then we are going to have to look over the law to determine first whether or not the local authorities should have a bigger hand in it and, secondly, they are going to have to be given a bigger hand with congressional legislation because without it you can't control the point of diversion and the amounts of diversion from the main canal.

The CHAIRMAN. The point in which the gentleman was exactly right and the witness is exactly right is that the Bureau of Reclamation recognizes State law, and that is as it should be. If you will proceed, then, Mr. Welsh.

Mr. WELSH. As a further indication of the current interest of our membership in reclamation development throughout the West, I would like to quote from the resolutions which were adopted at our annual meeting in Spokane in November 1950. I particularly call to your attention the broad development program outlined in Resolution No. 18.

Again those resolutions were mailed to each member of the committee and I believe you are familiar with them. I would like to pass over, but request that it be included in the record.

The CHAIRMAN. It will be included.

Mr. WELSH. Thank you, Mr. Chairman.

(The resolution referred to is as follows:)

RESOLUTION NO. 18—CONTINUED RECLAMATION DEVELOPMENT

Whereas the National Reclamation Association is dedicated to encouraging the development, conservation, and utilization of the water resources of the 17 Western States under sound policies in the interests of the country as a whole; and

Whereas the National Reclamation Association, while recognizing that the Federal Government has important responsibilities in the prosecution of programs for the development, conservation, and utilization of water resources in the 17 Western States, believes that those States likewise have important responsibilities in the same field: Now, therefore, be it

Resolved by the National Reclamation Association:

1. That the National Reclamation Association urges upon the executive and legislative branches of the Federal Government and hereby pledges its wholehearted support for the vigorous prosecution of a well-balanced program for the development, conservation, and utilization of water resources in and throughout the 17 Western States, including the construction of projects now under way and the authorization, adequate appropriations for and the construction of projects for the improvement of navigation, the control of floods, river regulations, and the development, storage, conservation, and use of waters for all beneficial purposes, including particularly the fulfillment of domestic, agricultural, and industrial needs, the development of hydroelectric power, the improvement and protection of national parks, monuments, and recreational areas, and the protection and improvement of conditions favorable to fish and wildlife to a reasonable and practicable extent consistent with the essential needs of water conservation and development, all to the end of enriching the country as a whole by providing domestic water, food, and fiber for an expanding population, and by augmenting the source of electric energy and water for farms, municipalities, and industries, thus making this country strong in peace and war.

2. That the National Reclamation Association urges upon the executive and legislative branches of the Federal Government and hereby pledges its wholehearted support for such legislation as, consistent with the acquisition and preservation of rights in water under State law and with the preservation of the integrity of the laws of the 17 Western States in this field, will tend to relieve

water and power users of the financial burden of costs properly allocable to broad national purposes served by Federal reclamation projects; to assure continued financial assistance from power revenues where applicable in the return of irrigation costs that are beyond the reasonable ability of the irrigation water users to return within a reasonable period of years; to clarify and to improve the terms of repayment and other contracts for the return of irrigation costs by water users; and to provide, to the fullest practicable extent consistent with serving and protecting the broad national purposes thereby serviced, for the local administration and operation of Federal reclamation projects, and features thereof.

The urgent need for continued reclamation development throughout the West in order to meet the food requirements of our rapidly increasing population was well illustrated in a statement submitted to the House Committee on Agriculture in August 1950, by Mr. Oris V. Wells, Chief of the Bureau of Agricultural Economics, United States Department of Agriculture. Mr. Wells suggests that we should first consider two broad questions:

1. What will be the Nation's need in agricultural commodities 25 or 30 years hence?

2. What is the present and probable future trend in the productivity of the agricultural resources upon which we must rely for our food, fiber, and forest products?

Mr. Wells then proceeded to point out that by 1975 the population of the United States "could well increase close to 190,000,000," at least 25 percent and "under the most favorable conditions the increase in population might be even greater." Mr. Wells then continued, "This calls for raising considerably our sights as to future farm markets. * * * It means the need for a continued increase in total farm output over the years ahead." Mr. Wells further stated, "In the long run we will need better maintenance and improvement of our farm resources than has been carried out in past decades." He then indicates that we may be able to increase our agricultural production by as much as 25 or 30 percent by 1975 or 1980, providing we do several things:

1. Assume a substantial amount of accelerated conservation and development work.

2. Make changes and improvements in land use and cropping practices.

3. Continue practices initiated over the past 30 years of greater use of commercial fertilizer, improved methods of weed, insect, and disease control and increased productivity through scientific research.

4. Bring into cultivation or under irrigation 12.5 million acres of new or old land by 1960.

It is interesting to note the changed attitude toward our food supply since the outbreak of the Korean War. The farm surpluses which were held up as a threat to our farm markets a year ago are now looked upon as a reserve stockpile—that is a source of strength in our defense program. These reserves were made possible by the unusual and excellent growing conditions throughout the entire country during and following World War II. This stockpile of reserves which gives us a feeling of security during these critical times might easily be wiped out by a great drought such as we experienced in the Great Plains States during the thirties.

If the present international situation should continue for 20 years or more then the final outcome might well depend upon our national economy and our ability to produce the food and fiber required to

sustain, with an adequate standard of living, our ever-increasing population.

The Department of Agriculture has taken note of this situation by recently moving from its export list a number of important agricultural commodities. And in that connection, I would like to call your attention, gentlemen, to a news release which appeared in the morning paper, page 2 of the Washington Post, the heading being "Food output boost lags behind eating." I won't request that that be inserted in the record, but it is available if you wish to see it.

Mr. D'EWART. Mr. Chairman, I think it would be interesting in the record. It isn't very long.

Mr. WELSH. All right.

The CHAIRMAN. Yes, we do need that for the record.

Mr. WELSH. Yes, sir.

(The article referred to is as follows:)

World production of important food products this year may total about 2 percent above last year, the Agriculture Department estimated yesterday.

This would bring production 4 percent above the prewar (1935–39) average. But increased food output has not equaled the prewar per capita consumption rate, in terms of calories, because of the world population increase.

The report said per capita consumption this year is expected to be the highest since World War II. In many countries it will be higher, as the quality of diets has improved.

Prior to the crisis in Korea, there was growing evidence that the supply of several food products might soon be in excess of demand, and the trend of prices was pointing downward, Agriculture said.

The impact of that crisis on the economy of many nations has modified the outlook considerably. Earlier concern about possible surpluses of certain products has virtually disappeared, and world prices of many foods have made marked advances.

In many countries, both importing and exporting, consideration now is being given to the problems of promoting production, building adequate reserves of essential food products, controlling prices and distributing available supplies among nations in order to support national defense.

Rearmament programs now under way in a number of countries have increased economic activity, and the expansion of employment and money income is likely to maintain or stimulate the demand for farm products.

In commenting on the food outlook in various countries, the report had this to say of Russia:

The food situation has improved compared with the tight situation that prevailed during World War II and the early postwar period, but the harvest of principal grains in 1950 is estimated to have been slightly less than in 1949. Grain export commitments for the 1950–51 season, as of January 15, 1951, amounted to 1.7 million tons, compared with estimated exports of around 1.5 million in 1949–50."

Mr. WELSH. Wool is one necessary commodity in which there is already a shortage. Stockpiles are being reduced in many others.

Realizing that factual information regarding the problems of agricultural requirements and agricultural production and their relationship to reclamation would be valuable to the President's Water Resources Policy Commission, our association arranged to have Dr. John Lee Coulter, eminent consulting economist, study and prepare an analysis of the problems involved, including agricultural production, food supplies, and population increase of the United States.

Dr. Coulter is a former President of the North Dakota A. & M., with an A. B. from North Dakota and a Ph. D. in agricultural economics from Wisconsin. Dr. Coulter enjoys a national and international reputation in that field. His numerous assignments have included Chief of Agricultural Division, United States Census Bureau,

1910–14; special appointment by President Woodrow Wilson to study agricultural conditions in European countries at which time he personally visited every country in Europe. Other assignments have included member of United States Tariff Commission, 1930–34 and special adviser to President Franklin D. Roosevelt, 1934–35.

During the past 15 years Dr. Coulter has been an independent economic consultant. Among his clients have been the National Association of Manufacturers, numerous sugar associations, the National Renderers Association, and many national farm and livestock organizations such as the National Grange, the American Live Stock Association, the National Wool Manufacturers Association and many others, as well as various committees of the Congress.

Dr. Coulter, in his report, shows how it was possible for us to meet the increased demands of our population, which increased from 100,000,000 to 150,000,000 during the past 35 years and then asks the very pertinent question, "But what about the future?"

Dr. Coulter's report was submitted to the President's Water Resources Policy Commission with the understanding that it would not be made public until after the Commission had made its report to the President. Because of the valuable information which this report contains, I hope Dr. Coulter may have an opportunity of appearing before your committee and presenting this information to you.

The CHAIRMAN. We shall invite him and welcome him.

Mr. WELSH. Thank you.

Not only do I appreciate the privilege of appearing before you today but especially do I appreciate the active interest and full and sympathetic understanding which the members of this committee have shown in the development of the land and water resources of the great western half of the United States. Not only will the development of these resources make us stronger in times of war, but these wonderful resources when put to beneficial use will make our Nation a better place to live in times of peace. I am sure that the entire West appreciates the splendid work of your committee.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Where there is no vision, the people perish. We hope that your organization can bring us vision as you have done here, not that the Nation may perish, but the western half of it may continue to grow as it has during a half century under reclamation.

Mr. WELSH. Yes, sir.

The CHAIRMAN. As I indicated at the beginning of the session, tomorrow is to be given over to the National Park Service, in an educational way. My mind runs back some years ago when I joined with the Congressman from Colorado, John Martin, in a start of the move "See America First." That was before the Second World War. That slogan—much was done with that slogan, "See America First."

Now these are wartimes. Travel is limited. Travel abroad is restricted, especially. But I should like to see the Park Service reemphasize now, to see America first. It is the duty of this committee to frame such legislation as will encourage the see America first.

The committee stands adjourned until 10 o'clock tomorrow.

(Whereupon, at 11:54 a. m., the committee adjourned to reconvene at 10 a. m., Tuesday, February 13, 1951.)

GENERAL STUDY OF IRRIGATION AND RECLAMATION PROBLEMS

WEDNESDAY, FEBRUARY 14, 1951

HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The committee met at 10 a. m., Hon. John R. Murdock, chairman, presiding.

The CHAIRMAN. The committee will come to order.

We will proceed with our study of fundamental matters over which the Committee on Interior and Insular Affairs has jurisdiction.

This is a continuation, then, of what we have had for the last few days.

I notice that several Congressmen who are not members of this committee have come in this morning. I would be glad to have our colleagues come up and join us so that we can look the witness straight in the eye from this vantage point. There will be some members absent, no doubt, this morning, so gentlemen, make yourselves comfortable wherever there is a convenient seat.

Because of our high regard for our witnesses this morning and their sage advice, I have extended a personal invitation to several Members from the West to sit in for at least part of the session this morning. We are all busy. You gentlemen not members of the committee have other business to attend to and some of you have told me that you have to get away a bit early, so we will proceed at once.

One of the most eminent water lawyers of the West and student of water resource matters, a man whom we have had before us very frequently, but not too frequently, is Judge Clifford Stone, of Denver. Judge Stone not only knows water law, but he knows western conditions and I think we might do well to start out our further hearings on the reclamation part of the program by calling on Judge Stone, who is in Washington for a short time on this trip. I consider the committee fortunate and I am glad, Judge, we were able to catch you in a way, on the run, or on the fly, whichever it may be. Judge Stone needs no introduction to most of you. Judge Stone, we will be glad to hear from you. You have a prepared statement, I believe.

STATEMENT OF HON. CLIFFORD H. STONE

Mr. STONE. I do.

The CHAIRMAN. I suggest we hear Judge Stone read this statement without interruption so that we can enable some of your colleagues from the "High State" to hear you and then get away.

Mr. STONE. Thank you.

Mr. Chairman and gentlemen of the committee, it is a great honor and a privilege to appear once again before this committee of the House of Representatives. The Committee on Interior and Insular Affairs—and by the way, you have changed your name since I was here before—is concerned with prospects for continued prosecution of the country's program for the development, conservation, and utilization of western water and land resources. I, too, am concerned with the self-same matter.

I venture to address you today—not in my capacity as director of the Colorado Water Conservation Board, nor in my capacity as vice chairman of the Upper Colorado River Commission, nor, even, in my capacity as first vice president of the National Reclamation Association. I speak to you rather as a citizen of the West, as one who has been living close to western water problems for more years than it may be wise to remember and, finally, as one who has been urged by his friends to make this statement today.

I do not propose to speak to you today of any particular interest that I may have in the authorization and in appropriations for one or another great reclamation project. For this is an occasion when we may not devote ourselves to the interests of one or another State or group of States. The answers to the question which is before this committee and before the country today transcend the interests of one or another State or group of States. They affect the interests of all 17 Western States. It is no exaggeration to say that they may well affect directly the economic welfare, strength, and survival of the Nation. They affect the interests of our Territories and insular possessions as well. Indeed, they go further than that. They affect the entire world.

The question I pose to you members of the House Committee on Interior and Insular Affairs and, through you, to the Congress of the United States of America is this: What about the Federal reclamation program in this and in the years to come?

Now, I am well aware that one possible answer to such a question can consist simply in an expressive shrug of the shoulders, signifying hopelessness, accompanied by a reference to perilous world conditions, to the need for immense expenditures, both at home and abroad, and to the slight prospect, in the light of these conditions and of this need, for the authorization of new projects and for adequate appropriations for projects authorized or under construction. I have, however, too great a respect for this committee and for our great legislative branch of Federal Government, to expect that I shall ever hear in these Halls the counsel of despair that would be inherent in such an answer. The people of this Nation look to this committee and to the Interior and Insular Affairs Committee of the Senate for something better than that. I have referred to the Nation as a whole; for, remember, this cannot properly be viewed as a sectional program.

No doubt, every member of this committee has a better grasp of world conditions than I have, Yet I doubt that any one of you can say whether we shall be at war on a large scale tomorrow, or the next day, or 10 or 20 years hence. We may well continue in our present state of feverish preparation for years to come. Does this mean that the Federal reclamation program is to be virtually abandoned for such a period—whatever it may be? The blow to our economic system that would result from such a shut-down might well be beyond

the endurance of the 17 Western States. It might well be reflected, too, in adverse economic effects on the country as a whole. Furthermore, quite aside from the economic disaster that would follow such a shut-down, there are other reasons why I think this country cannot afford an affirmative reply to that question.

It is authoritatively reported that the population of our country, during the period 1920 to 1950, has increased by more than 40 percent. And the trend is ever higher. But what about the rest of the world? Well, the same thing seems to be happening elsewhere. In many other parts of the world, according to an article published by the Population Reference Bureau, here in Washington, populations will more than double within the next 25 to 50 years.

It becomes clear, then, that the time is not far ahead when we shall be hard put to it to fulfill our domestic needs for the products of agriculture. It is clear, too, that the time lies not too far ahead—if, indeed, it is not already here—when we may need to ship food and fiber abroad in ever-increasing quantities. We can strengthen democratic governments abroad by shipments of food and fiber, as well as by the shipment of guns. Yet, we cannot maintain adequate food supplies for our own increasing population, at endurable prices, much less make needed shipments abroad, unless we continue to build our agricultural economic strength at home by continuing the programs of land- and water-resource development.

I have not said these things because I believe that we should seek to do the impossible. I realize full well that budgetary conditions may become such, from time to time, as to indicate the need for some retrenchment of domestic expenditures, including expenditures for reclamation, until most urgent defense requirements are met. The 17 Western States can and will do their patriotic bit to bear that part of the bitter fruit of man's apparent lack of capacity to wage peace as well as war. But—remember this—we cannot afford, by reductions in appropriations for projects authorized or under construction, to throttle the reclamation program. That program must be kept going. And the conclusion is inescapable that you must also build a shelf of authorized projects, both large and small, that can be undertaken during periods of reduced stress. You should have these projects ready to go. Reclamation projects are not investigated, planned, and built overnight. Their engineering takes a lot of time. The investigations that must precede them take a lot of time. This work should be done now. Projects should be authorized now. In other words, we should plan now for peace and, to the fullest practicable extent, we should build now for peace as we prepare for war.

There is much emphasis today on the power features of reclamation projects. This is not improper. Nor is it unnatural. We must have power in large quantities for the processing of mineral resources which are acutely needed in the production of industrial and defense materials. Hydroelectric power has been a part of the reclamation picture in the 17 Western States since 1906. It plays a part, not only in its own right but as a companion to the agricultural phases of the reclamation program. We would have it continue so. And, in order to assure that it will so continue, we would urge that, even in those cases where the need for power is deemed more acute than the need for increased agricultural production, the whole project of which power is a feature will nevertheless be authorized, even though con-

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struction of irrigation facilities be deferred, thus assuring the necessary protection of agricultural rights in water and suitable financial assistance in the return of irrigation costs.

What about the Federal reclamation program in this and in the years to come? The answer to that question is in your hands. I hope that you will agree with me, first, that the Nation cannot afford to throttle that program today; second, that the Nation cannot afford unduly to curtail that program; third, that the Nation cannot afford not to have a shelf of authorized projects ready for construction; and, fourth, that needed power production shall be obtained from features that derive their validity from the fact that they are parts of authorized reclamation projects. The country looks to your vision and to your courage. Even during this tragic period when we must put our minds and hearts to the task of preparing for defense, so we should also keep our minds and hearts on present domestic needs and on building for prosperity.

Let us not be guilty at home of having provided too little—too late.

That concludes my statement.

The CHAIRMAN: We thank you heartily, Judge Stone, for your statement. We probably have some questions we would like to ask you before you get away.

I noticed that our colleague from New Mexico, Congressman Dempsey, has come in to join us, I hope for the entire session. We are glad to have you, Congressman Dempsey, as well as the other Congressmen who are not members of the committee, but who are tremendously interested in this subject.

We recall that Congressman Dempsey was on this committee, as well as his neighbor, Congressman Fernandez, some years ago, before he got promoted to what was considered better committees. We also recall that Congressman Dempsey has served in other capacities, as Governor of New Mexico and a high official in the Interior Department. We are not surprised at your interest, Congressman.

Judge Stone, I have a good many complimentary things to say about your statement, but I think I will restrain myself a little on this occasion and probably say them to you privately. Are there any questions you would like to ask Judge Stone? Mr. D'Ewart?

Mr. D'EWART. I would like to ask a question, on page 4, about the middle of the page: The whole project for which power is a feature will nevertheless be authorized, even though construction of irrigation facilities be deferred. Thus assuring the necessary protection of agricultural rights in water and financial assistance in the return of irrigation costs.

I would like to ask that you draft language for an amendment to an authorization bill that would do what you propose in this sentence; in other words, permit the construction of the power features of the project, without the irrigation features, and still protect the irrigation rights.

Mr. STONE. I assume under my suggestion that the entire project would be authorized and it would contain language which I have already seen in bills before the Congress, which is designed to accomplish that very purpose.

Mr. D'EWART. In discussing this point with some of the other members of the committee, we have grave doubts whether agriculture and irrigation can be protected if power features are constructed without the agriculture features going ahead at the same time.

Mr. STONE. In my judgment, for whatever it is worth, I think that such language can be prepared which would adequately protect the irrigation features. Furthermore, one of the most effective protections is to design the project in such a way as to its features and the requirements for water to produce power that through the operation of the project and the features of the project, there will be reserved those upstream uses, which is generally the case, required for future irrigation development. My answer to that is that I am confident that through language and through the design of the project and operating principle of the project that can be accomplished.

Mr. D'EWART. I had a caller for the central Arizona project in my office the other day and we were discussing the possibilities of building the hydroelectric features of that project and postponing the irrigation features, and he said that that could not be done and adequately protect the irrigation features. That is why I bring up this point.

The CHAIRMAN. I am glad to have that brought up.

Mr. AANDAHL. I just wonder if a dam is built and a maximum of power units are put into the dam so that the full flow of the stream can be utilized in the development of power at the present time, in anticipation of later diverting some of that water for irrigation purposes, as the irrigation projects developed, if the Congress wouldn't have full authority to later make those diversions for irrigation as long as the power is being developed by a unit of the Federal Government. Now then, if private industry went in there and built the dam and secured the water right then we probably couldn't take it away but as long as it is a unit of the Government, regardless if it be the Corps of Engineers or the Bureau of Reclamation that is developing the power, is there any reason why Congress cannot later take some of that water away from them and say they cannot use it? They will have less power to sell but there is no vested right in that power except in a branch of the Federal Government. Does that reasoning seem logical?

Mr. D'EWART. I am inclined to believe you are right, but this caller supporting central Arizona said it was not possible to protect Arizona in the use of that water. That is why I bring up the question.

Mr. MILLER. And it also occurs to me that we set up under our water rights certain priorities for the use of water, irrigation, power, navigation, and so forth. Do we have priority for domestic use of water for power, or shall we say power comes ahead of domestic use of water? Shall we say water for navigation comes first? I think some of those problems are basic, but if you start working out amendments as to the protection of water, I think the domestic use of water should come first. It should always be recognized.

Mr. STONE. I might suggest to the committee in line with that point which you bring up that as to some of the rivers, and I refer particularly to the Colorado River, the Colorado River compact of 1922, a compact among seven States consented to by the Congress, provides that the use of water for power shall always be subservient to its preferred use for domestic and irrigation purposes.

Mr. MILLER. That is in several compacts, I believe.

Mr. STONE. My attention is called to the 1939 act wherein I find this provision:

> No contract relating to municipal water supply or miscellaneous purposes or to electric power or power privileges shall be made unless in the judgment of the Secretary it will not impair the efficiency of the project for irrigation purposes.

That is the Reclamation Project Act of 1939.

The CHAIRMAN. I take it from the comments made by the two Congressmen just now that you are trying to discover whether it is possible—we are talking now about reclamation projects in all 17 Western States—whether it is possible to develop the power features as a war need, saving the reclamation features for later development and do it legally and safely.

That is the idea, is it not?

Mr. AANDAHL. Yes, and it is my opinion that as long as the power development is vested in a branch of the Federal Government we have given no irrevocable right. The Congress and Government can take that power away and use the water for a subsequent purpose at some other time. However, if a private industry had gotten the water it would be difficult to take it away.

The CHAIRMAN. Since Congressman D'Ewart mentioned one project, although it was not my intention to bring out any one project, but since he did mention it, I would like to ask Congressman D'Ewart to consult again with the best authorities in regard to that central Arizona project to see if you got the meaning clear of your Arizona caller. What we want to keep in mind is this, that whether power development could be made first and then find agricultural developments irrevocably cut off, that is one thing that we do not want to do in regard to that one central Arizona project, or any other project in the West. Your whole purpose here, is it not, in your statement, Judge, is to say "It is one sided, it is worse than useless to go ahead with a partial development of our western rivers," emphasizing even the much-needed power, to the neglect of the agricultural development?

Mr. STONE. In answer to that, in many places in the West, if not all over the West, we are planning for the ultimate use of a limited water supply. It is obvious in the economy of this country, and to make the best use of that limited water supply, not only for the interests of the West, but for the entire Nation, we should strive to attain the maximum use from that water for all purposes. That is good economy. It is necessary. At the same time, we realize that in the West our agricultural advancement is strictly limited by available water supplies, and I have confidence, and I have given the matter much study, that through the two methods which I suggest we can attain the maximum development of our water resources and it must be done if we build the strength of this Nation. We cannot afford to let those great resources go unused, not just for the West, but for the whole Nation, and I think that as we get into our expanding populations, as we recognize our place in world affairs, that the greatest thing we can do to make this Nation strong is to use to the maximum feasible way a basic resource; and I would like to emphasize, this cannot be done overnight. I know projects that have been in the course of planning and construction for over 15 years, and what I am attempting to say to you is this, that it would be tragic, we would not be making this Nation economically strong in this hour of need, unless we do recognize this situation, not just as a peacetime activity, but in our present situation.

On the question which Congressman D'Ewart mentioned to me, I know of many rivers where that is a question, and I would suggest to you that you keep in mind that it is not just a matter of language, but it is a matter of planning these projects and the facilities of each

project and providing operating principles so that you can keep this a well-balanced program to accomplish the needs in the West, and, if I may add, the needs of this Nation.

Mr. D'EWART. You believe, then, Judge Stone, that in the case of the central Arizona development and in the case of Hells Canyon which is coming before the committee this session, we could go ahead with the construction of the power features, and postpone action on the irrigation features, and still protect the use for agricultural purposes of the waters that might be developed?

Mr. STONE. I strongly and sincerely believe that can be done by language in authorization bills.

The CHAIRMAN. I suppose some of you gentlemen who are not members of the committee may have to get away. I notice that Congressman Granger, of Utah, was here and had to leave to attend another committee. He is a great influence in this work. I notice Congressman Hill of Colorado, Congressman Rogers of Colorado, I notice also my colleague from Arizona, Congressman Patten. If any of you gentlemen find it necessary to get away, do you want to make a comment or ask a question? Mr. Hill.

Mr. HILL. Mr. Stone, I would just like to say that I am pleased to be invited in here this morning to listen to this fine discussion. I have drawn a line under one thing that I wholeheartedly agree with, and that is, during this time when we are more or less worried about war, we must not forget to plan for peace.

Mr. STONE. And to be able to wage effective war through building our resources.

Mr. HILL. I frankly confess that I came to the conclusion long ago that there is no economy in holding back or delaying the completion of a project that is already well under way, and so I appreciate the opportunity, Mr. Chairman, of being here this morning.

I have to go, too, but I am sure that this is a wonderful statement by Mr. Stone and I hope the chairman will see that it is placed in the Congressional Record. If you need any help on that, let me know.

The CHAIRMAN. Thank you.

Mr. Rogers, did you have any questions?

Mr. ROGERS. I have nothing to offer at this time.

The CHAIRMAN. Mr. Patten?

Mr. PATTEN. I am sorry I was late, Judge. I apologize to you. I couldn't get here. I have heard you before and I appreciate very much what you say. I was interested in your last statement in answer to Mr. D'Ewart's question. However, you wouldn't jeopardize the agricultural economy of any particular area in the interest of power. You would suggest it would be worked, if possible, to protect irrigation?

Mr. STONE. They could be worked in together so as not to jeopardize in any way the present or future agricultural development.

I would like to add this, Mr. Chairman. I want it clear that my situation here means that the entire project—and I want to make that statement to Congressman D'Ewart—my suggestion would envision the authorization of the entire project, including the agricultural features, but possibly through provisions in the bill that appropriations to proceed with construction of the agricultural features may have to be deferred because of budgetary conditions, but that the entire project be authorized, including all features.

You thereby effectively build a shelf of projects and you thereby make it possible to protect the use of that water for all purposes in the authorization. I don't know whether I made that clear, Congressman.

Mr. D'EWART. That wasn't quite the interpretation I put on your statement.

Mr. STONE. I would say I wanted to make it clear that the authorization would include authorization of all features.

Mr. D'EWART. In other words, you don't believe we can protect the use of that water for irrigation in the future without authorizing it at the same time as we authorize the power features?

Mr. STONE. It might be done, but the most effective thing is to authorize the entire project at once.

Mr. D'EWART. You think possibly we can do it, then?

Mr. STONE. Yes, sir.

Mr. D'EWART. I will say for the record that we could authorize the project and still protect irrigation. Would you agree?

Mr. STONE. I think that would be possible and yet I would eliminate any doubt by authorizing the entire project, and under certain financial or budgetary situations which may exist, it may be necessary——

Mr. D'EWART. I shouldn't be speaking for Idaho, but in the case of Hell's Canyon I understand these Idaho people are afraid to permit authorization of the hydroelectric features of that project without agriculture being tied to it directly because they are afraid that they will not get the benefits that might otherwise accrue to them.

Mr. STONE. I am somewhat familiar with that Hell's Canyon situation because of my interest in our sister States, in their reclamation development and through my discussion with some of those people I am familar with the basic question there. I believe that a project such at that, the protection should be accomplished in three ways:

First, through the appropriate planning to protect and correlate the present and potential agricultuarl uses with the power development.

Second, through appropriate language in the bill.

Third, through the authorization of the entire project, with appropriate language in a time of emergency, such as this, whereby it would be possible to defer the actual appropriation for construction of the agricultural phases.

Mr. D'EWART. I think they would be protected if we authorized the whole project, possibly, but my point I want to get clear is this, that you as a water attorney believe that we could authorize the power features without the agricultural and still protect the agricultural development in the future?

Mr. STONE. Maybe I had better answer it the other way. I misunderstood your question. I think that the most appropriate and desirable way would be to authorize the whole project and the beginning.

Mr. D'EWART. I know that and I agree that that is perhaps the right way, but can we authorize the power project and not the agricultural and still protect the development of irrigation?

Mr. STONE. I think it could be if the features were set up properly as to plan of operation. I do not think that it would be wise to limit protection of irrigation potentialities to that method. I would counsel authorization of the whole thing.

Mr. D'EWART. As a water attorney, it can be done.

The CHAIRMAN. Mr. Budge was seeking recognition.

Mr. PATTEN. Sir, I asked one question and I wondered if I could ask another. I am not entirely familiar with Hells Canyon, but in the central Arizona project, we speak of emergency. We have a rescue situation in Arizona which is also important to us. You would then counsel as a water attorney that you include the agricultural features where it is so vital to a State as water rescue?

Mr. STONE. I certainly would, because you have to view the whole project as a whole and why shouldn't you? You might have to defer construction of irrigation features after authorization.

Mr. D'EWART. One of the reasons we might not is because the Bureau of the Budget would refuse to recommend the project.

Mr. STONE. I have great faith in this committee. I judge that you are going to see that all purposes in water development in the West are adequately projected.

The CHAIRMAN. Mr. Budge sought recognition when I digressed to have our visitors heard. Mr. Budge.

Mr. BUDGE. Judge Stone, I would like to ask two or three questions, particularly with regard to the Hells Canyon project. I note in your conclusion here, under the designated fourth, you say this, "that needed power production shall be obtained from features that derive their validity from the fact they are parts of authorized reclamation projects."

In other words, I take it that you mean that the power should not be developed unless in connection with a reclamation project. I am wondering what the reclamation features of Hells Canyon, for example, would be.

Mr. STONE. Well, my answer to that is this: I think the day is long past when we can conceive of the development of water resources through large projects, except on an integrated basin-wide basis. If we are to obtain the maximum use of the water within a basin for all feasible purposes we cannot consider Hells Canyon or any project on the Snake River alone. I think you must consider that project along with all other phases of development in the basin.

I was through Idaho last fall. Even a casual observer can see the great need to use available water supply to place that beautiful land in cultivation, and under the present program, that is possible through the maximum utilization of all potentialities of the water use.

It is possible through not only repayment from the farmers, and their repayment must be limited to their ability to repay, but also through aid from power returns.

If you can adequately, and as I said, I believe you can and should, protect that potentiality, and also make it possible through aid in paying cost of irrigation features from power returns.

Mr. BUDGE. In other words, your justification for Hell's Canyon would be as a part of the basin-wide development? You don't contend there is any reclamation in connection with the dam itself?

Mr. STONE. As to that one project, but it is related to the entire development in that area.

Mr. BUDGE. On the basin project?

Mr. STONE. That is right.

Mr. BUDGE. Now, Judge Stone, with reference to Governor Aandahl's question there, basically, is it not true that the building of the dam for power purposes and for reclamation purposes are quite differ-

ent, the basic theory of your building? Isn't it true that in the reclamation project the water level goes up for storage purposes and then is used during the dry season? Consequently, the water level goes down, whereas with a power project the idea is to develop firm power and keep the reservoir at a constant height.

Now, having that thought in mind, can we have a power project for firm electric power which can also be utilized for irrigation?

Mr. STONE. The reclamation engineers and engineers representing the States have found and believe that accomplishment of irrigation and power can be worked out together, and I believe they can and must be. Now, you will have, no doubt, on most reclamation projects both firm and unfirm power. If our program was limited to power, then you might gain more power production, but we have got to recognize all uses of water and correlate and provide for operating principles and features which will accomplish both purposes. We should always recognize, though, that irrigation is the primary purpose of the Federal reclamation program.

Mr. BUDGE. You would not favor the construction, then, of some power dams for the development of firm power, and leaving out the irrigation features.

Mr. STONE. I certainly would not. We would not be carrying out the primary purpose of reclamation.

Mr. BUDGE. I noted in the Commissioner's statements here before the committee the first day that some $95,000,000 are recommended for the construction of irrigation and reclamation projects, and ninety-four million, some-odd dollars, are used or recommended for the use of solely electric power dams. Is that in line with your thinking as to proper development?

Mr. STONE. Well, I haven't analyzed those figures. Perhaps I can't answer your question directly. I can answer it this way, that in my judgment, we cannot disregard the irrigation potentialities in the Federal reclamation program of the West. That is primary in the reclamation program, but I recognize also for two reasons we should not eliminate the power potentialities.

The two reasons are that we should get the maximum feasible use out of that limited water supply for all purposes.

Second, that power is needed in order that we may be able to pay for those projects.

Mr. BUDGE. In other words, you would justify the power project upon the basis that they are an assist to the irrigation project?

Mr. STONE. That is one reason, and the other reason is that if we are wise, we will use our limited water resources in the West to the maximum feasible extent for all purposes.

Mr. BUDGE. If the two conflict——

Mr. STONE. If the two conflict, and you will find many provisions of the Federal reclamation law that the use of a project for power shall not adversely affect its primary purpose for irrigation.

Mr. BUDGE. In your opinion, do you think that basic concept should be changed?

Mr. STONE. No.

The CHAIRMAN. If the gentleman will yield, I notice Congressman Harrison was seeking recognition and I fear he has to leave early. Will you yield to Mr. Harrison, Mr. Budge?

Mr. BUDGE. I am finished.

The CHAIRMAN. Mr. Harrison.

Mr. HARRISON. Judge Stone, you said it was your belief that these projects should be developed on the power basis where at this time or in the near future the irrigation part could not be utilized. Undoubtedly the control of these projects would go into some Federal agency, and suppose we have a situation such as this in years to come, that you have started on a power project. You have utilized your power and it is being utilized to the maximum.

What assurance can you give us if we want irrigation projects or what guaranty can you give us that at the time the irrigation is feasible and can be used that the power which is already being used will be taken away from those people who are using it so that we may have the water for the irrigation projects?

Mr. STONE. My answer to that question is that in the three ways which I suggest, you will have that assurance; not necessarily that you take it away. First, that the project be so planned, and operation principles designed that through the physical set-up of the project the irrigation features will be protected. That water will be reserved.

Second, through adequate language in the authorization act, and third, and perhaps the most effective way to do it, is to authorize all features where irrigation is involved at the same time that the power is authorized.

Now, on the Hells Canyon, there is no doubt in my mind whatever but what that can be adequately and effectively protected through limiting the amount of water which is dedicated to power in the authorized project, or the limitation of the amount of water that is dedicated to that purpose; and secondly, through considering the potentialities for irrigation on that stream in the plan for the project.

Mr. HARRISON. One other question I would like to ask: You said in your statement that you feel it is necessary that these projects continue. Wouldn't you say that the basis of all that is not whether or not we need these projects which, granted we do in a great many instances, but rather upon the ability of our public as a whole to pay for these projects at this time when they have such an additional heavy demand upon their resources?

Mr. STONE. I think my statement on that is pretty well covered. I stated that I realized full well that budgetary conditions may become such from time to time as to indicate the need for some retrenchment of domestic expenditures, including expenditures for reclamation until most urgent defense requirements are met.

The 17 Western States can and will do their patriotic bit to bear that part of the bitter fruit of man's apparent lack of capacity to wage peace as well as war, but remember this, we cannot afford by reduction of appropriations for projects authorized or under construction, to throttle—I use that word advisedly at this time—to throttle the reclamation program.

The program must be kept going, and the conclusion is inescapable that you must also build a shelf of authorized projects.

Now, that means that because of this present condition, because of the part which water development, the part which water and the utilization of water will play in making this Nation economically strong during an emergency period, and as I pointed out, nobody can say how long this period is going to exist, we must be ready to

augment the production of food. We must be ready through the utilization of a basic resource and through this program to contribute to this over-all program.

That is the position which I take.

Mr. BUDGE. Mr. Chairman.

The CHAIRMAN. Mr. Budge.

Mr. BUDGE. I am drawing perhaps at length on this Hells Canyon because I understand that bill is to be before the committee in the near future. I do not quite understand Judge Stone, in a project such as Hells Canyon, which admittedly has no reclamation features, no irrigation, I fail to understand just what your thinking is in proceeding with the authorization of such a project when you say that the power should be subservient, or at least—that the irrigation and reclamation—should be authorized at the same time as the power project.

What irrigation and reclamation would you authorize at the time you authorized the Hells Canyon project?

Mr. STONE. Well, first, I think we all recognize that if the use of water for power in the West will aid in this defense program, and if such aid can be obtained while at the same time protecting the use of water for the future, irrigation development then that objective should be sought, and it is my answer it can be accomplished.

Mr. BUDGE. What would you do in the authorization of the Hells Canyon project to further the interests of irrigation and reclamation?

Mr. STONE. I would set up in that authorization a recognition and a statement as to the potential uses of water for irrigation above that reservoir, and I would so plan and insist that the project be so planned as to preserve those potentialities, and that would be included in the authorization act, and in addition to that, there are certain projects, such as the Mountain Home area—you are familiar with that project?

Mr. BUDGE. Yes, sir.

Mr. STONE. Which might well be authorized at the same time.

Mr. BUDGE. In other words, you would protect the upstream use at the same time you authorized the entire project?

Mr. STONE. Yes, sir; that is exactly what I mean.

The CHAIRMAN. If you will pardon me, I think I will call on Congressman Aspinall next, since our witness is a Colorado man. I presume you fellows are well acquainted and get together privately, but perhaps you have something for the record.

Mr. ASPINALL. I don't think I have very much to add to the discussion. I have no questions. I am inclined to differ with Judge Stone on this question of authorization of a power project under reclamation law without direct reference to the irrigation project that is to be taken care of at a later date.

I can see a great deal of difference personally between areas of the west where compact agreements have been entered into, and where they are a part of the basic law at the present time, as compared to those areas where only the irrigation law itself applies.

I think it is a dangerous precedent to talk about authorizing a project which later on will be used as an irrigation project to a certain extent and not take care of the authorization in the very beginning.

The practical question, let alone the question of the use of water, the practical question as to the allocation of moneys for the project

and for the interest on moneys used to be returned to the Federal Government, et cetera, make it in my opinion rather dangerous. I agree wholeheartedly with the Judge in his statement that this is no time to curtail necessary projects in the building of the Nation.

If we don't authorize and build projects from now on which will take us 20 years to complete, at the end of 20 years the Nation will be suffering from the lack of vision which we people of the west have had during this particular period.

The CHAIRMAN. I agree that the case is different where interstate compacts have been made. I think it is dangerous to authorize such projects piecemeal by authorizing power features first and deferring the irrigation features until later. The whole project should be authorized as one, although the actual construction of one feature might be delayed if need be.

Mr. STONE. Perhaps I didn't make my statement clear. I don't disagree at all with the advisability of when you are authorizing these projects to look at the river basin, and to authorize or take such action as, in the wisdom of this committee, will insure protection of the potential irrigation development. That is the primary use of limited water supplies of the West. Our agriculture in the West is limited by available water supplies and I don't believe that such use is going materially to reduce the power potentialities.

Mr. ASPINALL. Well, Judge, I think you are right and I think that that is what the meaning was in your statement, even from the very beginning, but Congressman D'Ewart over there with that searching mind of his endeavored to get you on the spot on another statement, and I don't think you meant it, I don't think you want the record to show it.

I think that you feel just like he does and like I do, that, if they are going to be multiple-purpose projects, they should be multiple-purpose projects from the time of origin.

Mr. STONE. And so authorized.

Mr. ASPINALL. And authorization.

Mr. STONE. And so authorized.

The CHAIRMAN. We have detained you longer than I thought we would, Judge Stone, and we have other witnesses whom we would like to reach.

Are there any comments or questions by other members of the committee?

Mr. MORRIS. I would just like to ask one question, Mr. Chairman. In these multiple-purpose projects that we have been talking about, is it or is it not legally proper and feasible and possible to authorize the power feature of it and provide for the authorization of the reclamation or irrigation or agricultural feature to follow later, based on contingencies, and even also would it not be possible to fix the appropriation to begin at a fixed date later?

In other words, what I am trying to say is this: Wouldn't it be possible to authorize the multiple purposes, but to provide that certain features be delayed as far as actual construction is concerned, based on certain contingencies, being fixed at a later date to begin?

Mr. STONE. If I understand the language contained in some authorization bills which I have seen, that is what is done. The multiple-purpose project is authorized for all purposes, but there is a provision

that during the emergency period there may not be appropriations made for some of the features, but the whole project is authorized.

Mr. MORRIS. The whole project is authorized, but for certain features, construction on them is to begin based on certain contingencies?

Mr. STONE. That is right.

The CHAIRMAN. I have a lot in mind which I would like to say but I am going to refrain, Judge.

Are there any other questions?

(No response.)

The CHAIRMAN. We thank you for what I regard as wise counsel, coming from a man who is unusually well informed.

We have asked Dr. John Lee Coulter, an eminent agricultural economist, to come before us this morning. I understand the doctor has a prepared statement. Perhaps he would like to brief it and be prepared to answer questions.

I judge from your title, Doctor, that you are going to stress this question of food and fiber production.

Mr. COULTER. Yes, Mr. Chairman and members of the committee, and guest Members of the House.

The CHAIRMAN. Would you care to proceed without interruption on your prepared statement?

Mr. COULTER. I have drafted a very short introductory statement and then would like to submit a more detailed prepared statement which might be made a part of your record, if I may.

The CHAIRMAN. That would be quite satisfactory. Our time is getting away from us. If you will, make the brief statement orally, and the entire statement will be incorporated in our hearings.

The CHAIRMAN. Would you be seated?

Mr. COULTER. This brief statement, if I proceed through it without interruption, won't take more than a matter of 10 minutes.

The CHAIRMAN. If you will identify yourself; we are not so well acquainted with you as we are with Judge Stone.

Mr. COULTER. I can't claim to have lived the biblical period of three score years and ten yet, but in due course I hope that I may.

During most of that time, I have been pretty closely related to the area west of the ninety-eighth meridian. I was born and reared on a farm, just on the border of the Minnesota-North Dakota line, the Red River, and had my bringing up there and my schooling in that area, in the University of Wisconsin, Minnesota and Iowa, but most of my time was on the other side of the river, from the Dakotas west, and for many, many years before I came onto the scene, my father had been a fur trader, Indian hunter, and explorer and whatnot, and had lived in those parts all the way from the Hudson Bay down to the Gulf, so that he was very familiar with that country, and we were brought up in the environment of the West.

While my studies were in Minnesota and Wisconsin and Iowa, they had to do very largely, almost entirely, in fact, with the natural resources and their utilization, and my doctor's degree was in economics, the field of economics and agriculture. A number of the universities in that part of the West at various times have given me various other honorary degrees, which have been of the same type, so that my work has been largely in the field of agriculture and natural resources.

Incidentally, I see on your committee our recent Governor from North Dakota. It was my privilege to serve for a period of 10 years as president of the State agricultural college of that State, so that my background is pretty largely that, but in my work I have been forced to travel pretty well over the world, and to see how the rest of the world is looking at this food question, and living, and shelter, and before I start this very brief summary, may I say that not so long since in visiting in England I was told by one of the leading authorities there who said, "You know, in America you think you do a lot of big things in a big way. For instance, your irrigation and reclamation. You think that you lead the world and you have a point 4 program now, so that you are going to show the rest of the world how to do some of these things," but, he said, "Will you look into the official records of Britain and note the fact there that Britain, during the period when they were in complete control of India, irrigated a greater acreage of land in India, which is now in effective production than the total amount of irrigation in the United States."

So we must not think that we are going to run the world on this, or that we are the only ones that have made a start in that direction.

Now, Mr. Chairman, this very brief preliminary statement: I note the 17 States west of the ninety-eighth meridian have about 60 percent of the land area of the Nation, and considerably less than 30 percent of the population. This situation is undoubtedly due in large measure to the topography of the country, added to the lack of an adequate supply of water, its maldistribution over the area, and over the various seasons of the year.

Yet, the mountains indicate vast mineral resources and forests, as well as pasture land for livestock. The sunshine and resulting heat are resources of incalculable wealth, and water, if fully utilized to best advantage, can increase the national wealth manyfold and provide for an increase of another ten or fifteen million people, bringing the total up to 50,000,000 or more within the lifetime of the younger generation.

But this will be possible only as a result of wise statesmanship, efficient engineering, large capital investments and hard labor.

We must think in terms of 25 or 50 years into the future and be guided by the experience of the last 25 or 50 years. The big job is a multitude of little jobs.

I think we will all agree that the first use of the water must be directly for personal human use, and indirectly for the use of the community, and in this thinking, we must visualize a population of not 35,000,000, but a potential 50,000,000 or more. Then I think we should consider the problem of flood control and conservation, and the stopping of erosion.

Nature has a way of destroying, as well as a way of producing. Because of the vast wealth buried beneath the surface which often calls for great quantities of water, and the fact that heat and sunshine and soil alone will not produce crops and livestock, but that these must have water, we must place water for mining, forestry, industry, and agriculture next.

Of course, water must often be used several times, and electricity and transportation are of equal importance from that point of view, but in a general way, the above is a suggested sequence for the area as a whole, as it is necessary to arrange an order of priority, and thinking in terms of 25 or 50 years ahead.

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Notwithstanding what I have said, I am sure we will all agree that generally all of these uses must be dealt with in any area project, and that each project has its own problems and major possibilities.

Thus, in TVA flood control, prevention of erosion and power obviously come first; at least after supplying direct human needs, and irrigation comes at the bottom of the list, or is entirely absent, and so the problem is localized.

In my study, I have had my mind largely on the West, without ignoring the national and world problems involved, and I have gone back into the experience of the last 25 or 50 years to get a guide to help lead us into wise policies for the area in question during the years ahead.

During the last 25 or 30 years, we have reduced the number of horses and mules in the United States by about 20,000,000 and thus we have added about 60,000,000 acres of good farm land to the task of providing food, clothing, and other products for the direct human use.

The automobile, tractor and truck, with roads, internal combustion engine and petroleum, made that possible. Twenty million people were thus provided for, but we cannot continue to reduce horses and mules because the number has already been reduced from the 30,000,000 level down to a scant 10,000,000 at the present time, and soon the number will be extinct, so you can't repeat that 60,000,000 acre job.

Until 25 years ago, we had about a million immigrants a year, and now only about a million during the past 25 years combined. Until 25 years ago, our exports of farm products far exceeded our imports of coffee, tea, cocoa, sugar, silk, spices, et cetera. In other words, we fed and clothed several million people in Europe with our exports.

Now our cotton exports are down from 10,000,000 to only about two or three million bales, and our wheat exports come from unwise exploitation of millions of acres of pasture and grasslands in the Great Plains area.

There was a time when we exported as many as a million head of cattle a year, live cattle, and sent along the corn, oats, barley, and hay, to fatten them on the other side. With mechanical refrigeration, Australia and Argentina now furnish Europe with a billion pounds of chilled and frozen beef, veal, mutton and lamb, but soon we shall find it wise public policy to put millions of Great Plains wheatland acres back into pasture and feed crops in the name of conservation in order to reduce the menace of soil erosion, including dust storms, etc.

Twenty-five million acres of southern cotton lands have been returned to pasture and feed crops for livestock, or to fruits, nuts and vegetables during the past 25 years. Thus, the 35,000,000 acres of prairie grasses and 25,000,000 acres of cottonland added to a total of 60,000,000 acres saved from pasturing and feeding horses have been converted into food and fiber for a population increase of 50,000,000 people, and that is my answer to the question, how did we feed 50,000,000 more people in the last 35 years when there has been no increase in our geographical area, and no increase in the improved land in farms in the United States. We have fed 50,000,000 more people in this country.

In the meantime, during the past decade, 1940 to 1950, world population has increased at some place between 5 and 10 percent, while food has increased only half that rate. Lower living standards are on the horizon in many parts of the world unless greater efforts are made to utilize lands and waters, which are now blessed with sunshine and heat. All of these factors and others touched upon in this memorandum seem to point to a well-developed program of reclamation, especially irrigation, in our Western States during the coming 25 or even 50 years.

The potential is at least another 17,500,000 acres of irrigation, and that, gentlemen, is equivalent to bringing in 35,000,000 acres of land of natural rainfall areas. In a very brief general way, that is the background of my analysis of why this thing is so terribly important, whether you think of it from the standpoint of the West, the movement west of the population, the utilization of the great mineral and forest resources, our place of the Nation in the world's economy, and the present situation in the world's struggle for a living.

I was asked by the National Reclamation Association a few months ago—I had been spending some months traveling around the world studying the situation—and I was asked by the National Reclamation Association if I would mind preparing a sort of a memorandum elaborating upon these points, or others related, not too extensive, and I prepared a 30-page memorandum for them, merely to give my way of looking at it, and why this thing is so important, and why the national legislative body must be the guiding light and determining organization to see to it that we do not act unwisely in these particular times.

I would like to offer therefore this brief memorandum, which has had no other use. I mean to say it has not been published. It was just prepared for the National Reclamation Association to set down the statistics on some of these points, and the Manager of the National Reclamation Association, Mr. Welsh, who is not able to be with you this morning, prepared a one-page introductory summary of this document. That, sir, is the general statement.

The CHAIRMAN. Without objection, the further elaboration will be accepted and for our printed record.

(The above-referred to memorandum is as follows:)

THE PROBLEMS OF AGRICULTURE

WITH SPECIAL REFERENCE TO CONSERVATION, RECLAMATION, AND IRRIGATION IN THE GENERAL AREA WEST OF THE 98TH MERIDIAN OR THE 17 WESTERN STATES OF THE UNITED STATES

(Prepared by Dr. John Lee Coulter, consulting economist, Washington, D. C., for the President's Water Resources Policy Commission, July 1950. Sponsoring organization: National Reclamation Association, Washington, D. C.)

FOREWORD

DO WE NEED MORE RECLAMATION?

In attempting to establish a national water policy which, of course, will affect reclamation and the development of the water resources of the arid and semiarid West, it seems quite evident that we should endeavor to find the answer to the following question: "In the light of national and worldwide conditions with respect to agricultural production and the rapid rate of increase in our population, is it advisable to continue our Federal policy of reclamation in the West?"

In order to find the answer to this question the National Reclamation Association has arranged to have Dr. John Lee Coulter, eminent consulting economist, study and prepare an analysis of the problems involved with respect to agriculture, food supply, and population increase of the United States. A former president of the North Dakota A. & M., with an A. B. from North Dakota and a Ph. D. in agricultural economics from Wisconsin, Dr. Coulter enjoys a national and international reputation in that field. His numerous assignments have included Chief of Agricultural Division, United States Census Bureau, 1910–14; special appointment by President Woodrow Wilson to study agricultural conditions in European countries at which time he personally visited every country in Europe. Other assignments have included member of United States Tariff Commission, 1930–34 and special adviser to President Franklin D. Roosevelt, 1934–35.

During the past 15 years Dr. Coulter has been an independent economic consultant. Among his clients have been the National Association of Manufacturers, numerous sugar associations, the National Renderers Association, and many national farm and live stock organizations such as the National Grange, the American Live Stock Association, the National Wool Manufacturers Association and many others, as well as various committees of the Congress.

This statement and analysis by Dr. Coulter is being submitted to the President's Water Resources Policy Commission with the hope that the information contained therein may prove to be helpful to the members of the commission in the difficult but important task which has been assigned to them.

WM. E. WELSH,
Secretary-Manager, National Reclamation Association.

SYNOPSIS

DO WE NEED RECLAMATION?

During the past 35 years the population of the United States has increased 50 percent—from 100,000,000 in 1915 to 150,000,000 in 1950. While during the same period the total available farm land has remained about the same—450,000,000 acres. How then were the additional 50,000,000 people, fed, clothed, and sheltered? How were we able to meet the demands of this increased population for food and fiber and at the same time maintain our highest standards of living? Several factors made this possible.

1. *A tremendous reduction in acreage devoted to cotton production.*—The cotton acreage from 1925 to 1929 averaged 45,000,000 acres, while at the present time it is less than 20,000,000 acres. Thus 25,000,000 acres have been made available for the production of food and fiber for human requirements.

2. *The shift from horses and mules on the farms and elsewhere to automobiles, trucks, and tractors.*—Prior to World War I there were more than 30,000,000 horses and mules on farms and elsewhere throughout the country. By 1949 this number had been reduced to less than 10,000,000—a reduction of more than 20,000,000—thus making available for human consumption the food and fiber produced on 60,000,000 additional acres.

3. *Expansion of wheat production in the Great Plains area.*—It has been estimated that at least 35,000,000 acres of grasslands in the Great Plains area had been plowed up and planted to wheat since World War I. Dr. Bennett, Chief of Soil Conservation Service, has recently stated, "There are probably as high as 8,000,000 acres in these Plains States that should be gotten out of cultivation and put back to grass—and kept in grass.

These shifts and changes in our farming practices have made available the products of more than 100,000,000 additional acres to meet the requirements of our rapidly increasing population during the past 35 years. But what about the future? With our population increasing at the tremendous rate of more than 2,000,000 per year, what would be the situation if during the "sixties" or the "seventies" we were again confronted with a drought such as we experienced in the "thirties"?

Our population is not only growing but it is moving westward. By 1975 there will be 50,000,000 or more people in the West. A balanced economy for these people will require the full development of all the resources of that area, particularly agricultural. This, in the arid and semiarid West, can be accomplished only through reclamation.

But reclamation is a slow process requiring many years to accomplish. Furthermore, the total remaining area to be developed is only about 17,000,000 acres or less than 4 percent of our present area available for farming. These increased irrigated acres, if brought under cultivation by means of reclamation during the next 25 years, would largely be offset by the present wheatlands of the Great Plains that should revert to grasslands and by lands going out of production because of soil erosion, which is an important and critical factor.

Thus, if during the next 25 years we bring under irrigation all of the remaining undeveloped irrigable lands of the West, it is possible that the total farming area of the United States may not be as large as it is today. But during the same period our population will increase by 50,000,000 people—or by 33⅓ percent.

> This memorandum is in response to the invitation by the Commission in its preliminary announcement of the scope and character of problems involved, contained in the following statement: "The Commission hopes that much will be gained by obtaining a fresh look (at these matters) from individuals outside of Government who are equipped to examine the problems in the broadest possible perspective * * *."

While the President's Commission may place different amounts of emphasis upon several different policies such as navigation and transportation, flood control, hydroelectric, etc., for different parts of the United States, this study is limited to policies believed to be especially applicable in the area west of the ninety-eighth meridian or including the 17 Western States of the United States.

Even though this study deals very largely with a limited area it is prepared from the standpoint of the public welfare and national security of the country as a whole, including appropriate general reference to our place in the world community of nations and special reference to the needs of the special area in question.

No time or space need be given in this short memorandum to a discussion of the truly marvelous unevenness with which water is distributed over the earth's surface and the constant changes resulting from evaporation, movement of clouds, precipitation, disappearance into subterranean areas, movement in streams toward the oceans, the action of the tides, etc., etc. The subject is sufficiently complex if we limit this study to the problems of utilization of water resources in our own country especially in regions where these are not now adequate or distributed in such a way as to most completely serve mankind by first providing the needs of plant and animal life.

Water resources obviously have as their primary purpose to supply all human, animal and plant life first directly and second indirectly, and the basic problem of government is to provide it in quantity and character at the time and to the place where it can be used to best advantage. The extent and the success to which mankind has shown ability to utilize water resources is an important indication of the progress of civilization.

WATER USES

While it may be generally agreed that all available and unused water should be considered first from the viewpoint of its use to supply general human needs which includes a multitude of community uses, obviously an equally important second use is for water to supply agriculture in order to provide the basic elements of life-giving food to members of the human race.

Man does not live by food alone although that is the first and nearest thing to life itself. Advanced society has found much of value in the physical resources of mountains and other surfaces and subterraneous areas. The third most vital requirement of people may therefore be conservation of water for local mines, quarries, and other industrial uses.

When we place water for hydroelectric power production in fourth place, we do not mean to classify electricity as of lesser importance. Much water may be available only for that use, or best adapted for that use, or it may be used first for power and later for uses one, two, or three or vice versa.

All the while engineers and Government agents must have in mind the necessity for flood control (including flood control as an adjunct of irrigation) and opportunities for navigation or water transportation after objects I, II, III, and IV have been exploited to the utmost.

LAND IN FARMS AND NOT IN FARMS

It is well to bear in mind that of the 1,905,362,000 acres of land area in the United States only 1,141,615,000 acres or a scant 60 percent are in farms. Most recently the land in farms has been classified by the Government (1945) as follows:

	Acres
Land available for crops	450, 694, 000
Divided as follows:	
Cropland harvested	352, 866, 000
Crop failure	10, 297, 000
Cropland idle or fallow	40, 082, 000
Plowable pastures	47, 449, 000
Land not improved or available for crops	690, 921, 000
Woodland pastured	95, 075, 000
Woodland not pastured	71, 261, 000
Other land pastured	481, 017, 000
All other land	43, 568, 000

It is obvious that much of the land not improved or available for crops, much of which however is used as pasture, lacks adequate water especially at the time most advantageous from the standpoint of growing crops. One of the first problems which clearly confronts the States and National Government is a detailed classification of the land resources and of the water resources not completely used and finally the optimum of uses possible, always bearing in mind the national economy, public security and general welfare. Nearby and long-time potentialities must be given equal consideration in such systematic classifications.

We need not here attempt to classify the land not in farms, although that is part of our problem. Suffice it to say that only recently (June 22, 1950) the House Public lands Committee presented to the President a report which indicated that substantially 24 percent of the land area of the United States or about 457,000,000 acres (largely west of the Mississippi River) are owned by the Government, leaving about 16 percent or about 308,000,000 in all parts of the Nation in all other classifications.

It is quite evident from this brief summary that even if all water available in the area west of the Mississippi River were devoted to community uses or utilized for irrigation it would fall far short of the amount necessary to provide normal water requirements for crops for all land available. At best, therefore, much land must go without water and much additional land must continue at best as grazing or hay land.

Actually, it appears from the above that only about 450,000,000 acres, or less than 25 percent, out of a total of 1,905,000,000 is improved or available for crops while, of course, much additional land is of value for pasture, hay crops, or forests. From this it will be seen that even if a perfect job were done of developing irrigation, it would represent only a small addition to that which depends upon natural rainfall, although each acre of irrigated land undoubtedly is the equivalent of two or more acres depending upon natural rainfall.

The following is a brief summary of irrigable acreage in the 17 Western States of the United States:

	Acres
Total area of 17 Western States	1, 162, 399, 360
Area works were capable of supplying with water (1940)	27, 007, 568
Acreage irrigated in 1939, other than Federal	16, 777, 833
Acreage irrigated in 1948, Indian reservations	550, 916
Federal reclamation projects:	
Irrigated, 1949:	
Full supply	2, 230, 465
Supplemental	2, 590, 124
Irrigable but not yet irrigated, 1949:	
Full supply	444, 894
Supplemental	391, 554
Under construction or authorized:	
New lands	7, 450, 000
Supplemental	4, 250, 000

Federal reclamation projects—Continued	Acres
Under investigation or proposed:[1]	
New lands	9, 390, 000
Supplemental	4, 670, 000
Total Federal reclamation projects	31, 417, 037

[1] Subject to change or issuance of Federal long-range program.

Sources: Census Bureau Reports; Office of Indian Affairs; Bureau of Reclamation.

These details are sufficient to show how small is the acreage involved in irrigation compared to total land acreage or compared to improved land depending upon natural rainfall, although, as already noted, the crop producing capacity of irrigated land far exceeds, acre for acre, the productive experience of non-irrigated lands. Without the products of the lands already irrigated, this country could at this time be critically deficient in the case of some major and many minor foods, fibers and other special farm products.

Substantially all of the so-called improved land or potential cropland had already been incorporated in farms by 1910, and differed but little from comparable acreage of cropland at the present time. Indeed much marginal improved land is now going out of cultivation due to erosion and depletion.

Land available for crops—	Acres
1910	478, 452, 000
1940	530, 131, 000
1945	450, 694, 000

Cropland harvested, crop failure land, cropland idle or fallow and plowable pastures.

POPULATION INCREASE, HIGHER LIVING STANDARDS AND FARM SURPLUSES

In contrast the population of the United States which passed the 100,000,000 mark July 1, 1915 has now passed the 150,000,000 mark, July 1, 1950, an increase of 50 percent. And yet we are told (*a*) that living standards have considerably improved; (*b*) that we have adequate supplies of food, fiber, and special farm crops for all purposes; and (*c*) that, in fact, we are threatened with burdensome surpluses of important staple crops and many specialties including oil-bearing seeds, potatoes, and miscellaneous fruits, nuts, and vegetables and some important animal and poultry products such as eggs, lard, and butter.

If this last statement is true how can we justify a recommendation for more conservation, reclamation and irrigation as an important part of water resources policies for the western area in question? Shall we aim at increasing production for export in order to pay for farm products now imported? What are the prospects for another 50,000,000 increase in population? What consideration shall be given to higher average living standards?

To deal completely with this problem of so-called surpluses at the present time would call for an examination of wartime and relief production aided by old men and women and school boys and girls. And it would call for a study of all wartime Government incentives. It would require a careful comparison of the wonderful weather conditions and yields during the decade 1940–49 compared with the yields of the preceding drought decade 1930–39 when we were even importing wheat 3 years in succession instead of exporting half a billion bushels as we did in 1947. And finally it would involve a study of so-called parity prices for farmers during war and post-war years due to general inflation and foreign relief programs. Thus, farmers, instead of getting 75 percent to 90 percent of parity, averaged 106 percent of parity in 1942 compared with only 55 percent of parity 10 years earlier in 1932. And during the war and postwar years farmers averaged 16 percent above parity, as follows:

	Percent of parity		Percent of parity
1943	119	1947	120
1944	116	1948	116
1945	117	1949	104
1946	121		

Such prices were an incentive to extraordinary production, in cooperation with favorable weather, patriotic incentives, etc.

In spite of continued favorable weather in most parts of the country and prospects for better than long-term average crop yields (thus far in 1950, July 26), the

index number of wholesale prices for all farm products continues as much above that for all commodities as during the whole year 1949, thus suggesting no real surpluses but indicating that all items are responding about equally to war-scare and other inflationary factors and are not due to general elements of surplus or scarcity. Such so-called surpluses as exist are almost entirely inventories incident to Government pricing policies.

REVOLUTIONARY CHANGE IN ACREAGE OF WHEAT PRODUCTION IN THE UNITED STATES

As a point of departure it will be well to record that by 1900 the acreage of wheat grown as a cereal in the United States had reached or slightly passed 50,000,000 acres. This was and still is the chief cereal for human food not only in this country but in Europe and many other parts of the world. Over a long period of time some wheat has been traded in commerce between nations, especially among countries of Europe, but never on a large scale prior to the development of steam vessels about a hundred years ago, and the expansion of railroads in this country during the same period.

Acreage of wheat harvested in the United States averaged about 50,000,000 annually during the 5 years preceding World War I, 1910–14. During that period immigration, largely from Western Europe, was at the rate of about a million persons a year so that the need of Europe for wheat from this country was probably reduced. By 1910 half of the wheat acreage of the United States had moved to the 10 Great Plains States, largely North and South Dakota, Nebraska, and Kansas, with smaller acreages in Montana, Wyoming, Colorado, and New Mexico, and a growing acreage in Oklahoma and Texas on the South.

Wheat production was also expanding very rapidly into the Western Provinces of Canada, into Australia and into Argentina and other areas to a lesser extent. This movement continued until the world supply became so great by about 1929–30 that the collapse in world wheat prices became an important factor in the world-wide depression of the decade 1930–40 in spite of the contrary influence of the drought and wind and dust storms in our Great Plains States during that period. As already noted, we actually became wheat importers during 1934, 1935 and 1936.

The following is a brief table showing leading producing areas:

Wheat acreage seeded

	1909–10	1947	1948
10 Great Plains States:			
North Dakota	8,188,782	10,407,000	9,676,000
South Dakota	3,217,255	3,858,000	4,040,000
Nebraska	2,662,918	4,489,000	4,499,000
Kansas	5,973,785	15,404,000	14,634,000
Montana	258,377	5,183,000	5,053,000
Wyoming	41,968	317,000	363,000
Colorado	340,729	2,676,000	2,829,000
New Mexico	32,341	724,000	618,000
Oklahoma	1,169,420	7,118,000	7,332,000
Texas	326,176	7,587,000	6,752,000
Total, 10 States	22,211,751	57,763,000	55,796,000
Total for United States	44,262,592	78,169,000	77,749,000
Total for 10 States listed above	22,211,751	57,763,000	55,796,000
All other States	22,050,000	20,406,000	21,953,000

From this table it appears that during the past 40 years production has expanded almost 35,000,000 acres and that the entire expansion has been in these Great Plains States. This expansion does not represent any significant increase in acreage of improved land but rather a shift from grassland to cultivated land.

We have already noted that the population of the United States increased from about 100,000,000 at the time of the beginning of World War I (estimated 100,549,000, July 1, 1915) to over 150,000,000 reported at the present time, July 1, 1950, an increase of 50,000,000 in 35 years. But 50,000,000 people would certainly not need more than 300,000,000 bushels of wheat for food or the product of over 20,000,000 acres, while wheat-acreage expansion in the Great Plains States has gone from 22,000,000 acres in 1909–1910 to 57,000,000 acres in 1947, an increase of 35,000,000 acres. It may be said therefore that the excessive expansion

of wheat in the Great Plains has been a calamity. While it did make it possible to feed Europe, it led to the breaking up of millions of acres of permanent grasslands which were not suited to cultivation. Of course, much of this was a part of the World War I program which led inevitably to the period of dust storms and soil erosion during the 1930's and now has been further exaggerated during World War II and succeeding years.

But this is the vast problem of conservation largely in the Great Plains States—the reduction of wheat and possibly of some other cereals and the restoration of hay and pasture grasses. However, it is closely related to the problem of water utilization, including irrigation. This subject is dealt with briefly at this point because it is so much a part of the problem of food supply and proper water utilization. While 35,000,000 acres or more of improved pastures and hay lands were transferred to fill the bread basket, this in the long run may have done more damage than good. A complete revision of the wartime policies would seem to be absolutely necessary—less wheat for export; more pasture, hay and forage, and livestock in the Great Plains States.

REVOLUTIONARY CHANGES IN SOUTHERN COTTON PRODUCTION

We have already noted that total improved land (including fallow land, crop failure, and improved pastures) amounted to 450,694,000 acres in 1945, and now we must add that in 1925 more than 10 percent of that total (45,968,000 acres) was devoted to production of cotton. In 1926 cotton occupied 45,839,000 acres and production was 17,978,000 bales of cotton, the largest of record with one exception (1937) when Government AAA controls were suspended and production reached 18,946,000 bales.

Contrasted with the average of 45,000,000 acres of cotton during the 5 years 1925–29, the acreage under Government control has averaged only about 20,000,000 during the 5 years 1945–49 and a present estimate of only 19,000,000 acres in 1950; and production fell to only 8,640,000 bales in 1946, or one-half of the production record in 1926.

This illustration is presented to call attention to the fact that under general Government policy as to agriculture the acreage of one of the greatest staples has been changed in a short span of 20 years by as much as 25,000,000 acres or equal to the total of all Federal reclamation irrigation projects, including those under construction or authorized or merely proposed or under investigation. But while we shifted from cotton acreage to food crops, Brazil, Russia, and other countries were expanding their cotton so that there was no shortage of fibers and textiles.

Passing mention should be made of the fact that from 1900 to 1930 exports of cotton ranged between 5 and 10 millions of bales a year, an average of not less than 7½ million bales a year. During the past 10 years exports have averaged less than 2½ million bales. Instead of clothing Europe we have literally been engaged in feeding our increasing population.

Just as we converted some 35,000,000 acres of improved pasture and hay land in the Great Plains States to the production of wheat, so we converted another 25,000,000 acres of southern cotton land to production largely of beef and dairy cattle and poultry and to production of fruits, nuts, and vegetables and special crops. Thus, without adding to the acreage of improved farm land, we transferred about 60,000,000 acres to production of cereals, livestock products and other foodstuffs. The end result was that we could feed more people.

REVOLUTIONARY CHANGES IN FARM LABOR AND POWER

At the close of World War I the United States Department of Agriculture reported a total of 26,723,000 horses and mules on farms (1918). The census of agriculture had disclosed a total of 3,469,662 horses, mules, asses, and burros not on farms at the time of the census in 1910. From these figures it appears that the country was providing pasture, hay, forage, grains and miscellaneous feed for a total of over 30,000,000 working, riding, and driving animals before the advent of motor vehicles—automobiles, trucks, and tractors. By 1949 the number of horses and mules on farms was reduced to 8,274,000. If we estimate a reasonable number for those not on farms it is clear that the total had been reduced to not more than 9 or 10 million at the present time.

It may be conservatively estimated that it would require the equivalent of 3 acres of grain, hay, and forage and improved pasture on the average to support each animal. A reduction of not less than 20,000,000 animals therefore must mean the release of another area of not less than 60,000,000 acres of improved

farm cropland which became available for production of food for human beings. This may be added to the 25,000,000 acres of land saved from reduction of cotton acreage, and the 35,000,000 acres of prairie pasture and hay turned to wheat.

EXPORTS OF CATTLE AND FEED HAVE ENDED

It should also be added that at the turn of the century before the advent of refrigeration steamships and before Australia and Argentina were able to supply Europe with literally billions of pounds of fresh, chilled, and frozen beef, veal, mutton, and lamb, the United States shipped literally millions of live cattle annually from midwestern farms and ranches to our eastern seaboard and shipped them alive to Europe where they were finished before slaughter. During that period great quantities of hay and grain were shipped along with the live animals. Much of the land then used to grow these cattle and the feed which we exported is now used for production of wheat. But in so doing we are destroying millions of acres of land in the Great Plains States where rainfall normally averages 9 to 12 inches per annum while double that precipitation (18 to 24 inches) are needed for such annual crops as wheat and rye, or flax or corn, oats and barley.

But it should be added here that very few cattle or meat or other animal products or feed grains or hay and forage have been shipped to Europe to aid in feeding foreign people during the past 25 or 30 years except as a part of some war program or in the form of relief. And the exports during the past 5 years have so often reduced domestic supplies as to be a significant factor in present high-price levels and general inflation.

THE PEOPLE OF EUROPE CAME TO THE UNITED STATES TO BE FED, CLOTHED, AND SHELTERED

Frequent reference is made to the fact that we in the United States for a century had such an abundance of land and such a relatively small population that we could export great quantities of food and fibers to Europe.

Total land area (continental United States) (1950)	acres	1, 905, 362, 000
Total population (continental United States) (1950)		150, 000, 000
Total land in farms (1945)	acres	1, 141, 615, 000
Land available for crops (improved land) (1945)	do	450, 694, 000
Improved land, available for crops (including crop failures, fallow land and improved pastures)	acres per capita	3

That was certainly true until the turn of the century or even up to 1910 or 1915, the beginning of World War I. By 1910–15 the free land was almost all gone, the improved farm land was already at its approximate maximum, about 450,000,000 acres, and population passed the 100,000,000 mark by 1915 (100,549,013 July 1, 1915). Up to that time the United States had been exporting hundreds of millions of bushels of cereals, especially wheat, annually, also as much as 10,000,000 bales of cotton and millions of pounds of tobacco annually, as well as a million head of live cattle and some other minor miscellaneous products. During the decade 1900–1910 average annual value of exports of all raw materials and of crude and manufactured foodstuffs combined was less than $900,000,000.

But by that time immigrants from Europe were coming to the United States by the million. (See attached table for immigrants—annually, 1820 to 1950.)

More than 40,000,000 immigrants have come to the United States since the War of 1812–16. The number was small during the years of sailing vessels—indeed only 6,354 in 1823 compared with more than a million a year in three successive years beginning in 1905 (1,026,499 in 1905, 1,100,735 in 1906, and 1,285,349 in 1907.) The number of immigrants had reached extraordinary levels by the time of the outbreak of World War I (1,218,480 in 1914). While the number fell to only 110,618 during 1918, the last year of World War I, because of complete lack of facilities, it was back up to 805,228 by 1921, and indications were that much of Europe was coming to America to be fed, clothed, and sheltered.

At this point the United States took stock of the fact that free land was at an end, exports of farm products had gone down to relatively low levels, and a new era was upon us. Very severe immigration quotas and restrictions were imposed. Immigrants have not reached the 100,000 mark in any year since 1930 except displaced persons each year since the end of World War II (108,721 in 1946, 147,292 in 1947, 170,570 in 1948, and 188,317 in 1949).

But the significant thing is that in order to feed and clothe the 50,000,000 added to our population since 1915, we have had to claim 120,000,000 acres of land formerly used as pastures chiefly on the Great Plains, cotton fields in the

South and land used to feed horses and mules (before the popularity of the automobile, truck, etc.). In addition, our exports have dwindled except in the category of emergency products for relief.

TABLE 1.—*Immigration to the United States, 1820–1949*

[From 1820 to 1867 figures represent alien passengers arrived; 1868 to 1891, inclusive, and 1895 to 1897, inclusive, immigrant aliens arrived; 1892 to 1894, inclusive, and from 1898 to the present time, immigrant aliens admitted]

Year	Number of persons	Year	Number of persons	Year	Number of persons
1820–1949 [1]	39,076,295	1862	91,985	1906	1,100,735
		1863	176,282	1907	1,285,349
1820	8,385	1864	193,418	1908	782,870
		1865	248,120	1909	751,786
1821–30	143,439	1866	318,568	1910	1,041,570
		1867	315,722		
1821	9,127	1868	138,840	1911–20	5,735,811
1822	6,911	1869	352,768		
1823	6,354	1870	387,203	1911	878,587
1824	7,912			1912	838,172
1825	10,199	1871–80	2,812,191	1913	1,197,892
1826	10,837			1914	1,218,480
1827	18,875	1871	321,350	1915	326,700
1828	27,382	1872	404,806	1916	298,826
1829	22,520	1873	459,803	1917	295,403
1830	23,322	1874	313,339	1918	110,618
		1875	227,498	1919	141,132
1831–40	599,125	1876	169,986	1920	430,001
		1877	141,857		
1831	22,633	1878	138,469	1921–30	4,107,209
1832	60,482	1879	177,826		
1833	58,640	1880	457,257	1921	805,228
1834	65,365			1922	309,556
1835	45,374	1881–90	5,246,613	1923	522,919
1836	76,242			1924	706,896
1837	79,340	1881	669,431	1925	294,314
1838	38,914	1882	788,992	1926	304,488
1839	68,069	1883	603,322	1927	335,175
1840	84,066	1884	518,592	1928	307,255
		1885	395,346	1929	279,678
1841–50	1,713,251	1886	334,203	1930	241,700
		1887	490,109		
1841	80,289	1888	546,889	1931–40	528,431
1842	104,565	1889	444,427		
1843	52,496	1890	455,302	1931	97,139
1844	78,615			1932	35,576
1845	114,371	1891–1900	3,687,564	1933	23,068
1846	154,416			1934	29,470
1847	234,968	1891	560,319	1935	34,956
1848	226,527	1892	579,663	1936	36,329
1849	297,024	1893	439,730	1937	50,244
1850	369,980	1894	285,631	1938	67,895
		1895	258,536	1939	82,998
1851–60	2,598,214	1896	343,267	1940	70,756
		1897	230,832		
1851	379,466	1898	229,299	1941–49	785,852
1852	371,603	1899	311,715		
1853	368,645	1900	448,572	1941	51,776
1854	427,833			1942	28,781
1855	200,877	1901–10	8,795,386	1943	23,725
1856	200,436			1944	28,551
1857	251,306	1901	487,918	1945	38,119
1858	123,126	1902	648,743	1946	108,721
1859	121,282	1903	857,046	1947	147,292
1860	153,640	1904	812,870	1948	170,570
		1905	1,026,499	1949	188,317
1861–70	2,314,824				
1861	91,918				

[1] Data are for fiscal years ended June 30, except 1820 to 1831, inclusive, and 1844 to 1849, inclusive, fiscal years ended Sept. 30; 1833 to 1842, inclusive, and 1851 to 1867, inclusive, years ended Dec. 31; 1832 covers 15 months ended Dec. 31; 1843, 9 months ended Sept. 30; 1850, 15 months ended Dec. 31, and 1868, 6 months ended June 30.

Source: U. S. Department of Justice, Immigration and Naturalization Service.

GROWTH AND DISTRIBUTION OF POPULATION ESPECIALLY DURING THE RECENT PAST AND EARLY FUTURE PROSPECTS

No satisfactory consideration can be given to the question of wise public policy, especially pertaining to such subjects as reclamation and irrigation, without brief examination of population trends and early future prospects for continued popu-

lation growth. But we need not go back of the early years of this century or the period of World War I since until 1900–1915 there was still adequate land in the United States for all practical purposes, and demands for reclamation and irrigation were not based upon a national shortage of food or fiber supplies. Population was increasing by leaps and bounds. Immigration was unrestricted and newcomers entered the United States at the rate of about 1,000,000 persons per year. Abundant supplies of many important staple farm products were available for export, far exceeding corresponding value of imports of the products of foreign agriculture.

Immediately following World War I, however, this whole problem took on very different characteristics. In general terms it may be said that settlement had reached the frontier and there was no longer any very considerable amount of free land available for settlers or at least that was true as to land suitable for cultivation and reasonably assured of an adequate water supply. Immediately following World War I, also, the National Government proceeded to restrict immigration so that by 1925 the volume of immigration had been reduced to extremely low levels.

For the first year for which detailed statistics were available agricultural imports exceeded exports in dollar value in 1922 and with very few exceptions agricultural imports have continued to exceed exports since that time except during periods of war and relief programs when materials for importation were not available and extra efforts were made to export an unusually large volume of agricultural products.

By 1915 the population of the United States passed 100,000,000 and since it is now estimated at more than 150,000,000 there has been a 50 percent increase in population during the past 35 years. If we take the postwar year 1920 as the starting point the population has increased since that date or during the past 30 years by nearly 45,000,000, or well over 40 percent. Assuming that according to our way of life and standard of living it requires something like 3 acres of natural rainfall land to provide agricultural materials needed per capita of population, it will be seen that since 1920 it would have been necessary to add something like 125,000,000 acres of improved land to the agricultural plant. Inasmuch as practically all suitable land had already been incorporated in agriculture by 1920 it will be seen that the problem during the past 30 years has been one of major adjustments rather than general expansion. We have already noted some of the major adjustments under discussion of (*a*) expansion of wheat production in the Great Plains area, (*b*) tremendous reduction in acreage devoted to production of cotton under Government auspices and (*c*) the shift from horsepower on the farms and elsewhere to the use of automobiles, trucks, and tractors. A fourth major readjustment involves (*d*) the extraordinary decline in volume of agricultural exports while at the same time depending upon a constantly increasing volume of agricultural imports.

Thus far in this brief discussion no consideration has been given to changes in living standards or changes in yields of staple crops per acre of farm land devoted to these crops.

From the standpoint of public policy, as it pertains to reclamation and irrigation, it is undoubtedly equally important to examine the problem of population distribution within the United States itself. Inasmuch as attention has already been called to the severe curtailment in immigration soon after World War I, we may reasonably examine population distribution as it has developed during the 30 years 1920–50.

There is attached hereto a brief table showing population for the United States as a whole, and for each of the 17 States which are the especial subject of this memorandum as well as the total figure for the 17 States combined and the total figure for the United States excluding the 17 Western States. From this brief table it will be noted that the population of the 17 Western States to which reference has been made only slightly exceeded 20,000,000 in 1920 at the close of World War I. The latest official estimate which refers to July 1, 1950, is 33,766,022. Undoubtedly when the final census reports for 1950 become available the record will show not much less than 35,000,000 people in these 17 Western States. Thus, the population of the western area under consideration will have increased from 20,000,000 to 35,000,000—an increase of 15,000,000 or 75 percent. The population for the rest of the United States was 85,655,000 in 1920, and will almost certainly slightly exceed 115,000,000 when the final census is announced for the year 1950. This will represent an increase of about 30,000,000. Thus, the increase of 15,000,000 for these 17 Western States will be approximately half as

much as for all other parts of the country combined and the rate of increase in these Western States of 75 percent will be double the rate of increase for the rest of the Nation.

Population increase, United States Census

	1920	Preliminary (July 1, 1950)	Increase	
			Number	Percentage
United States total	105, 710, 620	150, 520, 000	44, 809, 380	42.38
17 Western States total	20, 055, 343	33, 766, 022	13, 710, 679	68.36
All other States total	85, 655, 277	116, 753, 978	31, 098, 701	36.30
17 Western States:				
North Dakota	646, 872	616, 185	—30, 687	—4.74
South Dakota	636, 547	650, 025	13, 478	2.12
Nebraska	1, 296, 372	1, 308, 394	12, 022	.93
Kansas	1, 880, 999	1, 898, 519	17, 520	.93
Oklahoma	2, 028, 283	2, 230, 253	201, 970	9.96
Texas	4, 663, 228	7, 677, 060	3, 013, 832	64.62
Montana	548, 889	587, 196	38, 307	6.97
Idaho	431, 896	586, 037	154, 141	35.68
Wyoming	194, 402	288, 707	94, 305	48.51
Colorado	939, 629	1, 315, 206	375, 577	39.97
New Mexico	360, 390	677, 099	316, 709	87.87
Arizona	334, 162	742, 364	408, 202	122.16
Utah	449, 396	686, 842	237, 446	52.84
Nevada	77, 407	158, 378	80, 971	104.60
Washington	1, 356, 621	2, 361, 261	1, 004, 640	74.05
Oregon	783, 389	1, 510, 148	726, 759	92.77
California	3, 426, 861	10, 472, 348	7, 045, 487	205.59

From this brief observation it will appear that in spite of the fact that it was believed that free land was exhausted by 1920, and in spite of the fact that immigration was almost completely eliminated soon after that date, nonetheless the population of the Western States will have increased by about 75 percent during the 30-year period while the population of the rest of the Nation will have increased not more than 35 percent.

During the same 30-year period the population of the three Pacific Coast States increased 158 percent while the population of the 11 Western States, combined, increased 118 percent. The only Western States to fall below the national average in percent of gain during that period were the Great Plain States, and this was caused largely by the drought of the 1930's. Conservation, reclamation, and irrigation would undoubtedly change the trend in these States.

One reason for calling attention to the perfectly tremendous increase in population in this western region is the fact that here we now have nearly one-quarter of the population of the United States to be fed and clothed, while in a free economy such as we have preserved there may continue to be a very large movement of the products of agriculture as well as industry in all directions, especially in view of our magnificent system of waterways, railways, highways, and airways. Nonetheless from the standpoint of general welfare there is every reason to give favorable consideration to the desirability of utilizing the land and water resources of the West to produce most of the essential food and fiber crops needed for a population of this size. Already much corn and some fat cattle move west from the Mississippi Valley and much fruit, nuts and vegetables, lambs, wool, and other items move east from the Western States.

FUTURE POPULATION INCREASES

Thus far we have spoken only in retrospect and briefly examined the increasing population during the past 30 years. At least passing thought should be given to the prospective continued increase of population during the coming 30 years. Certainly no national policy worthy the name should give consideration to a shorter period than the next 25 or 30 years. If the population of the 17 Western States should increase no more during the coming 30 years than during the past 30 years—that is to say, 15,000,000—even that would bring the total population of the western area up to not less than 50,000,000 people. Looking at this aspect of the problem alone, it must be clear that during the 30 years ahead it should be a part of wise public policy to bring into a comprehensive reclamation and irrigation program all water supplies which can be made available as well as every available acre of land, since a population of 50,000,000 people will require not less than 40 percent more than is required at the present time.

After all is said and done, a region such as the 17 Western States with a population of 50,000,000 people would not only tremendously exceed in area such countries as Great Britain, France, or Italy, but would even exceed all of the different countries of Europe outside of Germany and Russia. A vast empire is to be fed and clothed and no stone should be left unturned to utilize all local natural resources. It may be that during the coming 25 or 30 years as much as 10,000,000 acres (or double that amount), largely in the Great Plains States, may be turned back from cropland such as wheat, oats, barley, flax, etc., to pasture and hay land, but in the meantime every possible acre should gradually over a 25- or 30-year period be brought into position where it can best serve the human population.

NONAGRICULTURAL POPULATION

In the discussion of total population, population distribution, and probable population increase during the next 20 or 30 years, reference was made only to the total population as distinct from that part of the population devoted to agricultural production. It goes without saying that only a relatively small percentage of the total population in the 17 Western States would be engaged directly in agriculture. In the United States as a whole something like 20 percent of the population is directly engaged in farm operations, and it is quite probable that in the 17 Western States the same situation would prevail. This is particularly true because of the tremendous labor requirements in the western region devoted to mining, trade and commerce, transportation, utilities, and other economic activities. The area is so great and distances are so magnificent that an unusual percentage of the total population must be devoted to building and maintenance of railways, highways, and other regional facilities. But this, in large measure, would be true whether reclamation and irrigation programs are carried forward or not, since the Western States already have such a large segment of the total population (35 million out of 150 million) and the West and East are already so closely integrated.

Perhaps more than passing notice should be called to the fact that the 17 Western States contain a very large proportion of the mineral resources of the Nation. Aside from coal and iron ore, an overwhelming proportion of mineral production in the United States comes from these Western States. Incidentally, both coal and iron ore are of tremendous importance in that area, too, and a very large proportion of the needs of the Western States for metal products is provided in that area alone. The addition of Geneva steel properties and other metal enterprises during the recent war illustrates the extent to which metal industries have and are now being developed.

Without enumerating the long list of minerals which are important in modern times, mention may be made of the fact that the United States, with only 7 percent of the world's population, on the average contributes about 12 percent of world gold production, 24 percent of silver production, 35 percent of iron ore, 63 percent of petroleum, 25 percent of lead, 35 percent each of copper and zinc, and 26 percent of coal. These percentages alone indicate the extent to which the United States leads the world, relatively, in the industrial field of mineral raw materials. And, as already noted, aside from the heavy production of iron ore and coal east of these 17 States, practically the entire production of the other minerals listed come from the western group.

The United States also far exceeds the world as a whole, percentagewise, in the case of such extremely important staple nonperishable products as wheat, corn, oats, tobacco, and cotton. And the 17 Western States contribute a very large proportion of all of these crops except corn and tobacco. These 17 States are likewise outstanding leaders in the production of forest products and such other special crops as sugar, potatoes, and commercial fruits, nuts, and vegetables. Because of this situation, the amount of trade between the 17 Western States and the eastern sections of the country is tremendous.

The above general statement is intended only to indicate the broad expanse of economic life prevailing in addition to irrigation and reclamation or agricultural activities as a whole. This same situation is found to exist down to each rural community or the reclamation or irrigation project. This question was introduced for discussion about a year ago in the House of Representatives during consideration of appropriations for the Bureau of Reclamation. As a result, a considerable statistical study was made, and for the year 1946 it appears that the proportion of town people to farm people on all reclamation projects is about 4.5 to 1.

A representative of the Bureau of Reclamation, in response to a question in that committee last year, reported that "during the last 5 years net incomes of

the 1,304,000 persons living on the Bureau of Reclamation projects averaged more than $1,000,000,000 each year. The 237,000 persons living on farms received average annual net incomes totaling at least $200,000,000, and the 1,067,000 persons living in towns received average annual net incomes amounting to at least $800,000,000. Of this $800,000,000 at least $400,000,000 arise directly or indirectly from the basic agricultural production of the projects."

(This subject is dealt with in considerable detail in the hearings before the subcommittee of the Committee on Appropriations, Interior Department appropriations bill for 1949, pp. 1010–1011 of pt. 3 of the hearings.)

While it goes without saying that there may be wide differences in human judgment involved in making an evaluation of the relative importance of many different groups or interests such as "irrigation" or the production of agricultural products on the one hand, and on the other hand "other community needs for water" contrasted with the importance of "flood control," "power production," "transportation," etc., nonetheless, it must be perfectly obvious that the basic first essential of all life depends upon the best possible utilization of natural resources in the production of food, clothing, and other basic human necessities.

A region rich in widely diversified natural resources which makes possible agriculture, forestry, fishing, mining, and all forms of industrial, commercial, and professional life, offers the greatest opportunity for the building of a well-balanced system. It would seem that any State or group of States or the National Government would be neglecting some of its greatest opportunities if they failed to develop comprehensive programs looking toward the most complete integration of all of the different economic activities which might be developed. This does not mean that every petty segment of a rounded-out economic life should be developed at whatever cost since, from the standpoint of the Nation as a whole, it would be desirable for the western communities to be closely linked with the rest of the Nation. But it does appear that every effort should be made to utilize water resources for the development of irrigation and agriculture wherever major economic considerations make this possible. However, each enterprise or group of enterprises must necessarily stand the test of studies made by engineers and other experts.

FOREIGN TRADE IN AGRICULTURAL PRODUCTS

No adequate or satisfactory study or plan can be made for development within any region or country without taking into account the extent to which the region or country is dependent upon foreign markets as a place to dispose of surplus products and the extent to which foreign markets are able to supply those things which cannot be economically or efficiently produced at home. From the very beginning of the national life of this country we were dependent upon foreign sources for many special products of agricultural origin and especially such items as tea, coffee, cocoa, silk, spices, etc. On the other hand, the United States found itself prepared to export substantial quantities of staple nonperishable farm products, such as wheat, corn, oats, cotton, tobacco, etc.

We need not go back to the early days in order to see how this trade between the United States and foreign regions developed. Attached hereto is a table which presents statistics showing the dollar value of exports of domestic agricultural products and in parallel columns the dollar value of imports. Without quoting statistics in detail, it will be observed from the attached table that during the first 25 years after the turn of the century, that is, up to 1925, the United States during every year except one exported a very much larger quantity of agricultural products than we imported. It is interesting to note here that the year 1925 again appears to be the dividing line in the general agricultural economy of this Nation. In other words, the whole immigration policy had been changed and other important economic policies had been revised, as already noted.

In contrast, during every year since 1925 (with the exception of the war and postwar years, 1942 to date) imports of agricultural products have substantially exceeded in dollar value the quantity of farm products exported. Thus, we have a statistical or dollar measure of the fact that from the agricultural viewpoint the United States is no longer self-supporting—with the exception of the war and relief programs just noted. And it should be added here that the apparent excess in dollar value of exports is largely the result of the price structure. Thus, back at the beginning of this 25-year period, during which imports have exceeded exports, the average price of rubber imported was as much as 54 cents per pound throughout the year, whereas during the last year, on account of our development of synthetic rubber, the foreign invoice value of rubber has been only one-third of that figure. On the other hand, the season average price per bushel for wheat

during the past 5 years has been about $1 per bushel higher than it was 25 years ago.

Of course, another reason for the present excess of exports over imports has been the lack of foreign products available for importation on the one hand, while on the other we have been exporting as much as half a billion bushels of wheat in a single year compared with considerably less than half that amount during the period 1925–30. In other words, the Great Plains of the United States have been broken up. Magnificent pasture and hay lands have been destroyed. Soil erosion has made deep inroads upon millions of acres of land, and we are rapidly destroying our most-valuable natural resources in order to perpetuate a war economy.

While an entire volume might well be written on this subject, and blame for the present unsound economic situation be placed upon the world-wide depression of the 1930's and World War II of the 1940's together with postwar reconstruction and relief programs, nonetheless it must suffice here merely to say that this recent period is so abnormal that it cannot be used as a basis for long-time planning for our own general welfare or national security.

Just one final word on this subject. Local news items and editorials have appeared in the press from coast to coast during recent days (July 11, 1950) to the effect that "The prevailing situation has been summarized by Dr. H. H. Bennett, Chief of the Soil Conservation Service, in these words: 'There are probably as high as 8,000,000 acres in these Plains States that should be gotten out of cultivation and put back to grass and kept in grass.'"

This has reference to the fact that even this year there are dust disturbances which most of the people of the United States are not aware of.

Another official statement is to the effect that: "The dust storms this year already have been more severe than at any other time since 1938. Reports to April showed 5,250,000 acres damaged by wind erosion this spring in the Southern States of the Great Plains. Adding to this the damage done in North Dakota, South Dakota, and Montana for the same period, and including the damage over the summer months for both sections, it is evident the loss will be tremendous.

When a comprehensive program is finally developed and excessive production of such crops as wheat has been eliminated through constructive conservation programs, it will again be found that the United States is importing very much larger quantities of agricultural products than we are exporting. From this viewpoint there is perfect justification for a comprehensive program of reclamation and irrigation during the 30 years just ahead, even if population increase should be at a very much lower rate than it has been during the past decade.

RELATIVE STANDARDS OF LIVING IN THE UNITED STATES AND OTHER PARTS OF THE WORLD AS A FACTOR IN DETERMINING IRRIGATION AND OTHER AGRICULTURAL PROGRAMS DURING THE YEARS JUST AHEAD

It is generally conceded that the people of the United States as a whole have attained living standards substantially higher than those found in the rest of the world, although it is well known that there are small fairly restricted areas in Europe and elsewhere which have been able to keep pace with that found in the United States, especially from the standpoint of food, clothing, and shelter.

It has already been noted that the United States has scarcely 7 percent of the world's population and yet from the standpoint of agricultural products produced and consumed, this country produces and makes use of a vastly higher proportion of world food and fiber supplies. Perhaps it may be true that in terms of such staple cereals as wheat, rye, and rice, the people of this country do not consume in pounds per capita more than the people of such vast areas as Europe and Asia. The same may be true with reference to certain bulky root crops and some vegetables, but when it comes to diversified fruits, nuts, and vegetables throughout the year and particularly when it comes to poultry and animal products, production and consumption in the United States so far surpasses that of other parts of the world that it is difficult to make a reasonable contrast.

And it so happens that the area of the 17 Western States of the United States is peculiarly adapted to the production of poultry and livestock of all categories as well as fruits, nuts, and vegetables. And water is the basic element which (with desirable soils and the most diversified seasonal temperatures) makes possible the extraordinary development of these products.

While it is true, of course, that water is quite necessary in the United States east of the western group of 17 States in order to provide our vast population with the cereals and with certain livestock products such as beef, pork, dairy, and

poultry products, nonetheless in these 17 Western States the utilization of our water resources to the fullest justifiable extent becomes imperative. Here we have vast areas and temperatures so diversified and marvelous in their range that it would seem to be a matter of imperative necessity that governments devise whatever methods are needed to conserve and utilize every drop of water. This is true not only in order that the 35,000,000 people of the 17 States be adequately fed and clothed, but that the population of the rest of the United States may be equally well provided since such tremendous quantities of food and fibers move eastward from west of the ninety-eighth meridian.

When reference is made to the average standard of living in the United States in contrast with living standards in other parts of the world, it is always desirable to note that even with the extraordinary American standards there are still perhaps as many as 25 to 30 million Americans whose diet could be improved and whose health could be greatly benefited if adequate supplies of dairy and poultry products, fruits, nuts, and vegetables were available at reasonable prices. In other words, while as many as 25 or 30 million of the most prosperous citizens may have, not only an abundance, but enough so that much is wasted, and while the middle group of nearly 100 million may be substantially provided for at the highest living standards yet attained anywhere, none the less it does appear that if the poorest 25 or 30 million were adequately supplied there would be a domestic market for all of the additional farm products which might be produced on the additional land which might be irrigated if all western water supplies were economically utilized. This note of caution is inserted here merely to stress the fact that there is no need to fear burdensome surpluses if the American people are themselves adequately provided for. There are problems of efficient preserving, storage, transportation, marketing, pricing, and so forth, but however difficult these problems are, they should not be allowed to support the argument that there is danger of an unusable surplus of farm products if a few additional million acres of land should be efficiently watered in the Western States.

YIELDS OF AGRICULTURAL PRODUCTS

When the question of reclamation, especially irrigation, is under discussion, even within groups of a dozen or more, it is almost certain that the suggestion will be made that instead of vigorously pursuing these programs for the development of natural resources, it would be better to devote a little more effort to the increase of yields of products on land already included in the agricultural industry. It is, of course, true that yields of many farm products could be increased by the application of more labor and more scientific methods and especially as a result of more widespread utilization of commercial or mineral fertilizers. Perhaps all of the fruits, nuts, and vegetables and even of the cereal grains, grasses, and forage crops could thus be increased. Perhaps the same conclusion could be drawn with reference to the feeding of different classes of animals. It is not believed that that subject needs to be separately considered in connection with the problem of reclamation and irrigation. It is largely a problem of relative costs and price relationships. Ever since colonial days progressive agricultural leaders have been engaged in scientific efforts to improve crop and livestock production. With the passage of the Morrell Act and later the appropriation of special funds for agricultural experiment stations, perfectly amazing results have been secured in the whole field of breeding, feeding, management, and related sciences. Undoubtedly, the use of commercial fertilizer has its very important part to play in this whole problem of feeding the human race. But in spite of the progress of 150 years, we have only reached the point with which we are all familiar—and to depend upon science and engineering alone would be indeed short-sighted. It is a fact that the average yield of the more important staple crops has not changed greatly over a period of 75 years, except for climatic factors, or greatly extending the use of fertilizer. It is also a fact that some of these staple crops have been extended out onto relatively richer or poorer marginal land or into areas with lack of rainfall.

In this connection, however, the point of greatest importance is to recognize that soil conservation must have a primary place in this whole program. Literally, tens of millions of acres of land are suffering either from water shortage or wind erosion. In the Great Plains States this must be recognized as a part of any effort to preserve our natural resources. Literally tens of millions of acres of land which have been plowed must be gotten back into pasture, hay, and forage crops. This has been estimated as high as 40,000,000 acres. This is also essential as a part of any great national livestock program. And finally this involves the most comprehensive irrigation program which can be worked out. Every acre of land

which can be irrigated should be brought into the picture in order that there may be high-yielding pastures and larger quantities of hay and forage crops as well as local supplies of grains and other feed crops for livestock during periods when livestock cannot depend upon the range land or the pastures and general hay crops.

While the irrigated lands of the West may not be needed for the production of wheat, either for the American population or for export to feed the people of Europe, it may be highly desirable for small acreages of wheat and feed crops to be planted merely from the standpoint of rotation or from the standpoint of providing tillage, roots, or stalks (straw) to improve the physical condition of the land for other or succeeding crops. It must be perfectly clear, however, that total production of any crop now in surplus, such as wheat, would be so negligible as to be unimportant from the standpoint of relating irrigated wheat production to national or world surplus.

Summary and Conclusions

A comprehensive statement of national water resources policies should think in terms of the next 25 or 50 years when dealing with the most desirable utilization of water resources in the area west of the ninety-eighth meridian—the area of the 17 Western States.

In turn, it is imperative that brief reference be made to a similar recent period.

Population.—According to official Government statistics the population of the United States passed the 100 million mark July 1, 1915. During the 35 years since that date it is estimated that the population has increased to about 150 million—an increase in the 35 years of 50 percent.

Crop lands.—According to the Government figures the total land in farms available for cultivation or growing crops was 507,000,000 acres in 1920 and only 512,000,000 acres according to the last official census reports for the year 1945. In other words, acreage of tillable land, including improved pastures and hayland, increased only 5,000,000 acres or less than 1 percent during the past 25 years. Following are important statistical details:

Statistics pertaining to land utilization agricultural statistics USDA 1949 yearbook, table 614, p. 565

[Millions of acres]

Land in farms available for crops	1910	1920	1930	1940	1945
Million acres, total	442	507	522	510	512
Cropland harvested	322	362	359	321	353
Crop failure, cropland idle or fallow	25	40	54	78	50
Plowable pasture	95	105	109	111	109

Foreign trade.—Prior to 1920 the farms of the United States produced enough more of products than required for domestic use so that exports exceeded imports of products of foreign agricultural origin every year for which official statistics are available. The first year for which imports exceeded exports was 1922. But since 1925 imports have exceeded exports during every year except during the recent years of World War II and the recovery period.

Immigration.—Prior to 1915 migration of surplus population primarily from Western Europe to the United States frequently exceeded 1 million per year. In fact, immigration into the United States averaged more than 1 million a year during the 10 years preceding the outbreak of World War I (1915). Thus, while the volume of agricultural exports from the United States exceeded the volume of imports and we were engaged in providing great quantities of foodstuffs, fibers, etc., to the people of Western Europe, none the less an average of more than a million a year were migrating to this country to be fed directly from our surplus farm products, which, however, they helped to produce.

Immediately following World War I a comprehensive program of immigration restrictions was initiated and immigration during past 25 years combined has only slightly exceeded 1 million. It may be added that the total number of immigrants largely from Western Europe to the United States reached almost 40 million during the 100 years, 1820 to 1920.

The basic problem.—Inasmuch as (*a*) the United States has been a net importer of products of agricultural origin each year during the last 25 years (except during

recent war and postwar relief years), and (*b*) immigration had declined from an average of more than 1 million per year prior to restrictions to only about 1 million during the past 25 years, and (*c*) improved or tillable farm land has increased a total of less than 1 percent during the recent 25 years, 1920–45, while (*d*) population of the United States or number of people to be fed, clothed, and sheltered has increased 50 million or 50 percent during the 35 years, 1915–50.

The questions which must have the greatest bearing upon the problem of efficient utilization of water resources must be, "How then were the additional 50 million fed, clothed, and sheltered during this recent period?" Also, "How could it be that living standards in the United States have been so materially improved during this same period?"

Answers to these two questions should be very helpful in developing recommendations with reference to agricultural development west of the ninety-eighth meridian or including the 17 Western States during the years just ahead and especially the question of most efficient utilization of both water and land resources.

Wheat expansion into Great Plains area.—Perhaps first in importance is the fact that during this same period (1915–50) we plowed millions of acres of the finest grazing and hayland in the Great Plains area (within the boundaries of the 17 Western States) and about 35,000,000 acres were added to wheat. Thus, without any increase in the acreage of improved land we not only produced enough additional wheat to feed the 50,000,000 additional people in this country but during the war and postwar years we have been able to supply extraordinary quantities of surplus wheat to the countries of Western Europe. This has been the biggest factor in holding export farm products at an unusually high level. But during that period we had the experience of the great drought years, dust storms, and wind erosion and we should prepare ourselves to deal with a similar situation during the coming decades. Indeed, during several years of drought (1934–36) the United States was on a net import basis for wheat. We must now reverse our steps, conserve our resources and restore our pasture and hayland as a basis for restoring our livestock industry.

Reduction of cotton acreage in the South.—In line with the transfer of perhaps as much as 35,000,000 acres of pasture and haylands in the Great Plains to wheat was the reduction in acreage of cotton in the Southern States, thus releasing a very large acreage of what was cotton land for the production of hay and feed for livestock and also the production of increasing quantities of fruits, nuts, and vegetables and special crops. It may be noted here that whereas cotton acreage averaged around 45,000,000 during the 1920's the estimate of acreage for this year (1950) is less than 20,000,000. In other words, 25,000,000 acres were shifted from cotton to the production of food of various kinds.

Mechanization of agriculture and reduction in number of horses and mules to be fed.—A very much larger item resulted from the mechanization of agriculture. Automobiles, trucks, and tractors took the place of horses and mules. At the close of World War I (1920) the Government reports showed a total of not less than 30,000,000 horses and mules in this country. The estimate at the present time is less than 10,000,000. The reduction of 20,000,000 certainly represented the shifting of not less than 60,000,000 acres of improved pasture, hay, and grain land from the feeding of livestock to the production of food for human beings.

Improvements in farm practice versus soil erosion and depletion.—In addition to the movements indicated above, research, experimentation, fertilization and improvement of all aspects of farm practice have helped to feed the increasing population with ever increasing living standards. There have been some important increases in yield for special reasons. None the less, especially during the decade 1930-40 there was a tremendous loss of top soil and fertility throughout the Great Plains area as a result of wind erosion. More than ever now conservation reclamation, and irrigation must be added to research and other improvements to provide for food, fiber, special crops, forest products, fish, wild game, and recreational facilities so important to the general welfare. Instead of higher living standards we may otherwise find ourselves confronted with another drought and very much lower standards of living.

Need to raise living standards for poorest 20 percent of population.—While still thinking in terms of a water resources policy for the western area, and while on the average we have extremely high living standards in food, fibers, and so forth, non the less there is much yet to be done to bring the least well provided for (25 or 30 million) up to our medium standards. It is generally conceded that there are still many in this country suffering from malnutrition, undernutrition, and so forth, all of which means poorer health.

Uses of water for other purposes.—While community uses for water and agriculture should come first in any comprehensive program, we must remember that there are not less than four, and perhaps more, persons in any general area for each farmer. A fully rounded out national economy is desirable. Mineral resources must be developed especially in this western area. Hydro-electric power should be provided wherever possible. Flood control must receive constant consideration, and transportation and other special uses must be included in any complete water program.

In conclusion.—We must not allow ourselves to be blinded by the fact that we have been able to care for an increase of 50,000,000 people in 35 years by plowing prairie grazing and hay lands, driving cotton production to Brazil, Russia, and other foreign areas, mechanizing farming and making other revolutionary changes in agriculture, most of which cannot be repeated and some of which have led to erosion, depletion, and loss of tremendous acreages of improved land. Nor should we assume future weather conditions to be like those which prevailed during the decade 1940–49 instead of the drought years of the decade 1930–39. And we cannot count upon the extraordinary efforts to produce which were applied under the patriotic motives of foreign wars and relief programs. Nor, finally, should we be deceived by war and postwar inflated price levels which have averaged 16 percent above what the Government defines as price parity and which have led to temporary surpluses of some farm products in some areas during some seasons pending return to greater economic stability, both in the United States and elsewhere in the world.

We must assume a continued population increase and a growing demand for higher living standards. The outstanding opportunity to meet this challenge is continued and expanding development of conservation, reclamation, and irrigation. That applies especially to the greatest justifiable, economic utilization of the water resources of the West in bringing available lands into production as part of our agricultural program.

The CHAIRMAN. I feel that it would be very, very valuable. In fact, Doctor, this is the first time I have ever met you. I want to thank those who referred you to this committee.

I would like to beg leave to change the order at this time. We want to ask you some questions. I will begin with the gentlemen who were not given an opportunity to ask questions of the preceding witness, but before beginning with Congressman McMullen, I think we ought to hear from the Governor. If this man has been one of the public servants up there in your State, Governor, now is the time to call him to task, if he needs it.

Mr. AANDAHL. Well, Mr. Chairman and members of the committee, I just want to say that I have enjoyed and greatly appreciated the statements that Dr. Coulter has made. I think he has given us some extremely valuable information about the importance of agricultural production in the western areas in the period that lies ahead. I also want to say that Dr. Coulter was one of our outstanding college presidents in North Dakota and the people of North Dakota have a very sincere admiration for him, as well as deep appreciation of the work that he did while he was in our State.

The CHAIRMAN. Mr. McMullen, had you any questions or comments?

Mr. MCMULLEN. I don't believe I have any questions, Mr. Chairman, but I do want to thank Dr. Coulter for this fine talk he has given us here. It has been very helpful to me and will be in matters that come before the committee in the future. I appreciate it very much. It was a very interesting discussion.

The CHAIRMAN. Congressman Bow, had you any questions?

Mr. BOW. No, I had no questions, Mr. Chairman.

But I want to join the gentlemen in saying that I appreciate very much the statement that has been made. It has been very helpful.

The CHAIRMAN. Congressman Yorty?

Mr. YORTY. Well, Mr. Chairman, I, too, want to thank the doctor. I think the priorities that he set up for the use of water, based upon his long experience, are probably very important and something that we can keep in mind in weighing the various projects that we will have to pass upon.

The CHAIRMAN. Congressman Budge?

Mr. BUDGE. Nothing, Mr. Chairman.

The CHAIRMAN. Congressman Aspinall?

Mr. ASPINALL. No questions.

The CHAIRMAN. Is there anything further, gentlemen?

(No response.)

The CHAIRMAN. Congressman D'Ewart?

Mr. D'EWART. I was interested particularly in the order in which you put preferential use of water.

Domestic, first; flood control, second; agriculture, and I suppose that includes irrigation, third; industry, which would include power, mining, and navigation, last.

Mr. COULTER. Yes.

Mr. D'EWART. You doubtless heard the discussion before you came on the floor, which indicated the concern this committee has with regard to power being set ahead of irrigation, as is evidently being done at the present time. That was the basis of the discussion that was before us, and we are much concerned over it and we are trying to discover a way to protect agriculture, including irrigation. I note particularly that you put industry, including power, below agriculture, which includes irrigation.

I think you are right in that order, and I think that agricultural production is basic, and I think you have made a contribution to the committee in emphasizing that agriculture, including irrigation should come ahead of industry and power.

Mr. COULTER. I think the world study, if it teaches us anything, and the movements of people, would indicate that. Basically, we must have life, we must have food, clothing and shelter, utilize the natural resources there. If you find as a war need, emergency requirement that some little segment of a project should be speedily done without endangering the longer period ahead, the generations yet to come, why surely legislation can take care of a situation like that, but I certainly would not ignore the fact that you have the heat, the light, the sunshine, you have water but not enough, not distributed well. Soil alone won't grow plants or feed livestock, and therefore your committee has a tremendously important task ahead of it.

The CHAIRMAN. Governor Aandahl?

Mr. AANDAHL. That brings a question to my mind and I think probably the question should be directed more to the members of the committee than to the witness.

I am in accord with the priorities that have been suggested for the use of water. Irrigation development, however, comes relatively slow. In many of the areas of the West it is probably going to be 25 or 50 years, and I am even thinking in terms of 75 or 100 years before we have a maximum development of the irrigation potential.

Now then, in the meantime can we advisedly temporarily use water for power development in amounts that will later be used for irrigation? I know that—under our present programs of development—

this is being contemplated and being done, which relates very specifically to the question we have been discussing here this morning.

Mr. ASPINALL. Mr. Chairman, will the Governor yield to me for a minute?

Mr. AANDAHL. Yes.

Mr. ASPINALL. With that in mind and with the water law as it is at the present time, do you know of any other means by which you could change your priorities, except through condemnation proceedings, Governor Aandahl?

Mr. AANDAHL. Well, that relates to the observation that I made a little while earlier when Judge Stone was our witness. I am of the opinion that where a department of the Federal Government such as the Bureau of Reclamation puts in a power unit and uses the available water for the time being in the development of power, the water right that the department of the Federal Government has for the development of power could later be taken away—by the Congress—and the water used for irrigation and reclamation purposes.

Now, probably, to safeguard that purpose, there should be some proviso in the authorization at the time that it is made for power, so there would be no question in the future that that was the intention of Congress.

Mr. ASPINALL. We are right back there in that instance where we were the day before yesterday in our discussion. Who is to control these water rights, the States or the Federal Government, and I think that we have a basic conflict that we must be very careful of when making our decisions.

Mr. AANDAHL. Of course, Mr. Chairman, I would like to make one other observation. I don't know of any way by which you could grow wheat except by water and soil, and I do know of many ways that you can produce power other than hydro electric.

The CHAIRMAN. That is a good comment. Dr. Miller?

Dr. MILLER. I have enjoyed the doctor's comments, especially the fact that the production of food or any job is made up in a multitude of little jobs before you get the big ones done.

I think, too, the philosophy, your philosophy, is good and the Nation to survive must have an expanding economy, expanding population, and maybe an increased tempo, but one thing you did not touch upon, which is of great interest, is the fact we are able to feed ourselves, and we have made in the last few years tremendous progress. That is due to the fact that we have developed new seeds and new methods of cultivation, the use of fertilizers and insecticides, the use of chemicals in food.

I happened to be on a special committee studying chemical substitutes in foods and the use of fertilizers and the use of insecticudes and pesticides, and developing foods, and what happened to that food when it got to the food stream of the Nation and the world.

It is interesting to note that the use of chemicals as substitutes for natural fats for flour, for eggs, and the fats that we have, that grandmother used in her foods can be displaced now by chemicals.

Two companies last year sold more than 10 million pounds of substitutes for fats. They are in position to make billions of pounds of it, much cheaper softeners for bread, to keep bread soft, for the housewife who goes in and feels the bread, she says it is all soft, the bread is soft but it may be several weeks old. There is good progress.

There are several things entering into the agricultural picture in the production of food through the use of chemicals and fertilizers and pesticides, that has made it possible and perhaps in the next 10 or 5 years, there will be a tremendous production of food. I do not devalue and I think we must look forward to production of irrigation projects. You say perhaps 17 or 18 million acres can be brought in, some of it submarginal, but over the next 25 or 50 years, unless the Nation is to go through a process of erosion, or deterioration, we probably will have to develop the natural resources, including our power and soil conservation, to meet the expanding economy, expanding population, and increased tempo of living, but don't lose sight of what happens in your foods as regards fertilizer, insecticides, and chemicals.

Mr. COULTER. In this memorandum I have devoted section 2 to the results of research and experimentation stations and use of fertilizers, and so forth, which quite naturally having been director of a State experiment station for many years, and president of a college, I might do. We are familiar, well, take the synthetic fibers, taken from trees up in Alaska and bringing them down and making rayon or nylon, and so forth. We have many fine illustrations of what science can and is doing.

The CHAIRMAN. Doctor, when you said a moment ago something about soil alone not being everything, I began to wonder about that, and then I saw your point. I am delighted that you stressed as you did not only soil and water and the proper combination of the same, but also sunshine. It takes all three. I presume you could take any food or fiber, that the large percentage of the same has come from the atmosphere rather than from the soil.

Mr. COULTER. Yes.

The CHAIRMAN. Water was simply an agency, a necessary agency to get the elements together.

I am no scientist. I don't even know how to spell the word "photosynthesis," but I do hope that you scientific men will work that thing out so that we will know the part that radiant energy plays. That has something to do with this committee, and I was hoping for further light on it. I hope it is in the extended statement.

Mr. COULTER. You, of course, are enough of a chemist to know that sugar, which is produced in such abundance out in the irrigated area, doesn't come out of the soil at all. Sugar is taken out of the air, just as our radio takes sound out of the air. Sugar is merely carbon, hydrogen, and oxygen, and all three, the pure white sugar, with all impurities removed, is taken purely out of the air. Now, you have to have a plant, called a beet, which goes down into the soil, and with the water and the soil and the sunshine and the heat, you have a plant with the leaves, and then the leaves collect the carbon, hydrogen, and oxygen and deposit it in the cells, and then you pull up the beet, and wash the sugar out, and dry it out and you have pure sugar, which is the highest form of concentrated energy food for the human race, entirely taken from the air, so over that area there are billions of tons of sugar uncaptured, as in this room at the moment, if you had a radio you could turn a little dial and pick up a song instead of my voice.

Mr. MILLER. Just at that point, Doctor, you wouldn't raise sugar beets if you didn't use fertilizer either. In most areas you require that.

Mr. COULTER. But the fertilizers are purely in order to get the plant to grow so that you have a good bunch of plants which are so constructed that they can take the carbon and oxygen and hydrogen and deposit it so you can get out your sugar.

Mr. MILLER. I might say there are over 800 chemicals in the last 5 years, knocking at the doors of the food industry, for use.

Mr. COULTER. That is true.

Mr. MILLER. Some 300 of them haven't been even examined. We don't know whether they are harmful to the human being or not. Some used in the past have been harmful to human beings, but here we have these chemicals which are directly competitive to the farm products. Some 450 are being used now, and many of them substitutes, or at least improved food products.

Mr. COULTER. That is certainly true.

Mr. MILLER. The potential is tremendous.

Mr. COULTER. That is part of the scientific phase of the subject.

The CHAIRMAN. I want to assure you that I have other reasons besides having a sweet tooth and coming from a land of sunshine for my last comments.

Mr. Farrington, you had a question?

Mr. FARRINGTON. Mr. Chairman, I would like to ask Dr. Coulter if he believes that within our time or within the next two generations, scientists will develop a system of utilizing the great energy in the movement of the ocean waves for the generation of power and an economical system of distilling salt water so it can be used for irrigation?

Mr. COULTER. It might very well be. Of course, a number of countries, take the British Isles, a few months ago I was over there, and was quarreling with them because they didn't have the kind of meat and eggs I wanted. But they said, "We have fish." And they were gathering from the ocean about them literally hundreds of millions or billions of pounds of fats and oils and meats from fish, and the water itself in all probability will be brought into use.

There are great areas, very great areas—north Africa is an illustration at the present time—where the waters that are now thought to be useless and currents of the ocean thought to be useless. We have spent a hundred years overcoming the currents of the ocean, by putting on steam and power engines, so we can cut against currents of the ocean, and currents of air but I think we will be utilizing the tides and the powers of the ocean in a matter of a generation or two. I think we could possibly even now, theoretically.

The CHAIRMAN. Well, we thank you for your long look ahead, Doctor.

Mr. COULTER. Thank you, sir.

(Witness excused.)

The CHAIRMAN. I asked a gentleman with whom we are pretty well acquainted already to come prepared to make a brief statement today. Mr. Rising, I fear we will not be able to hear all of your statement, but perhaps we could include the remainder of it in the record at this point.

Perhaps you had better identify yourself to the committee because there may be someone who does not know you.

STATEMENT OF E. W. RISING

Mr. RISING. Mr, Chairman, I certainly thank you for this opportunity of appearing here before the committee this morning. I am simply a citizen of the West, and have been in Washington for the last 15 years, representing the irrigation and reclamation interests of the West, especially the States of Idaho and Montana.

Mr. Chairman, my home is in Idaho. I am engaged in the development of the land and water resources of the West, particularly the resources of the States of Idaho and Montana. Through the efforts of our State water conservation boards, irrigation districts, and development organizations, supplemental water has been provided for several hundred thousand acres of land previously having an inadequate supply of water for irrigation. Additional projects have been authorized to largely complete our supplemental water program.

Many of our projects for irrigation of large blocks of new land, however, are either in the investigation state or feasibility reports are under consideration by the Congress. While we take great pride in what has been accomplished by the Bureau of Reclamation and by local initiative, we find we have only made a beginning in the development of our resources.

For the years 1947, 1948, and 1949, the average annual value of crops produced on the 2,000,000 acres of land irrigated under Bureau of Reclamation projects in the Columbia Basin was $105 per acre, or a total of $210,000,000 per year. Investigation has shown that one local business has been created by each 150 acres of irrigated land in Idaho and that urban income—indirect local benefits—from wages, interest, rents, and net income of business exceeds farm income by the ratio of 1.27 to 1. We, therefore, have local income of $105 per acre for the farmer and $133 for local business, or $238 per annum for each irrigated acre, indicating a total local income of $450,000,000 to $500,000,000 from the slightly less than 2,000,000 acres of irrigated land in the Northwest.

Bear in mind, this is local income only and does not include income from various services, such as transportation, processing, and marketing in outside areas. The annual local income each year far exceeds the total cost of Bureau of Reclamation project construction chargeable to irrigation.

Many of the projects constructed by the Bureau of Reclamation in the West, for storage of water for irrigation, municipal and industrial water supplies, also permit the development of large blocks of power. As examples, I mention Grand Coulee, Shasta, and Hoover Dams.

However, in our haste to provide additional power for defense purposes, we are neglecting many urgently needed smaller projects that can be constructed quickly and would develop sizable blocks of power. Facilities for the irrigation of project lands could be deferred, if necessary, until the most urgent requirements of our defense program are provided. As examples of these smaller projects, I mention the Yellowtail Dam and the Missouri-Souris Diversion Dam, in Montana, the Palisades and Scriver Creek Dams and power units, in Idaho.

Similar projects are needed in many Western States. These projects will provide for a better distribution of defense factories and

employment in tasks essential to our national defense without concentrating people in the areas where large projects have been or are being constructed by agencies of the Federal Government.

We are advised by the Bureau of Reclamation that water is available to irrigate 16,840,000 acres of additional land and provide supplemental water for 8,920,000 acres now inadequately supplied. Certainly, few of us can be satisfied to remain idle when we think of the huge volume of water that rushes unused to the sea every year in flood season. As just one example of water waste, I will mention that the annual run-off of the streams of the Pacific Northwest is over 200,000,000 acre-feet, and we are actually using only about 18,000,000 acre-feet (or less than 10 percent) of our supply for irrigation in that area.

True, we have constructed the cheap or low-cost projects but by the development of power resources in connection with our irrigation projects and the continued aid to irrigation from power revenue, including, where necessary, a small factor in the power rate, the feasibility of irrigation projects will be established.

It has been adequately shown by Dr. Coulter and Judge Stone that we need additional irrigated land to meet our food requirements. While, in normal times, we have had some food surpluses, careful investigation will convince anyone that little of these agricultural surpluses come from irrigated areas. The facts are that the people in the irrigation States are importers and consumers of many surplus agricultural products produced in dry-land farming areas.

When we consider that we have, in the last 25 years, almost fully absorbed the surpluses from lands formerly needed to provide feed for our horse-and-mule farm power and that our population is increasing at the rate of more than 2,000,000 per year, we can, by making just a few computations, approximate the number of new acres we will need 10 years from today to provide food for 25,000,000 more people.

One method of estimating would be to say 25,000,000 means an increase of one-sixth in our population, and we will, therefore, need one-sixth more agricultural land than in cultivation today to provide necessary food in 1961.

Another easy, and, I believe, correct way is to say that each additional person will require 2 acres of irrigated land or 3 acres of dry farm land to provide food. Twenty-five million more people, therefore, means 50,000,000 additional acres of irrigated land or 75,000,000 acres of dry farm lands for production of food.

Suppose it is found that one-half of the additional farm land that will be required by 1961 can be provided by drainage and rehabilitation of lands in the East and South and that only 25,000,000 acres of irrigated land will be needed, we would still require all the irrigated land on projects now under construction, authorized or proposed by the Bureau of Reclamation.

Our problem, then, is how can we provide irrigation for 25,000,000 additional acres that will be needed by 1961?

I have prepared a table which I submit for the record, showing that the authorized projects for which data was submitted to this committee on February 12 will provide only 691,263 new acres with irrigation and a supplemental supply to 976,320 acres; the total being equal to about 1,000,000 acres of new irrigated land.

Authorized reclamation projects—irrigation and hydro power.

Project	Division	Acreage		Other benefits	Total cost	Required first year
		New land	Supplemental			
				Kilowatts		
Central Valley, Calif.	Sly Park	3,500	3,850	(1) (2)	$6,049,000	$2,457,000
Minidoka, Idaho	North side pumping	77,650			10,377,000	1,745,000
Palisades, Idaho	Dam and reservoir		650,000	[3] 112,500	76,601,000	10,000,000
Paonia, Colo.	Spring Creek Dam	2,210	14,830		4,492,000	785,000
Riverton, Wyo.	Muddy Ridge canals	22,250			4,385,670	2,694,000
Solano, Calif.	Monticello Dam	77,000	5,000	(1) (4) (5)	45,577,000	6,000,000
Weber Basin, Utah	Weber aqueduct	70,400	30,000	(6) (7)	69,534,000	1,225,000
Yakima, Wash.	Kennewick	16,700		[3] 12,000	10,736,000	1,674,000
Do	Rosa			[3] 10,000	1,856,000	808,000
MISSOURI BASIN						
Nebraska-Kansas	Bostwick canals	28,000				2,444,000
North Dakota	Cannonball Dam	12,500			12,695,000	1,628,000
Glendo, Wyo.	Glendo Dam		42,640	[3] 72,000	44,384,000	3,700,000
Jamestown	Dam	22,000		(7)	10,749,000	875,000
Solomon division	Kirwin Dam	11,500			18,155,000	1,375,000
Marias division	Tiber Dam	127,000			64,065,000	5,907,000
Missouri-Souris	Diversion unit	91,100		[3] 18,000	97,356,000	5,087,000
Narrows unit	Dam	40,000	230,000	(7)	42,247,000	1,875,000
Owl Creek unit	Anchor Dam	17,113			2,856,000	730,000
Sargent unit	Milburn Dam	16,340		[3] 3,320	10,671,000	1,227,000
Shadehill unit	Distribution system	12,000			3,019,000	315,000
Yellowtail unit		44,000		[3] 200,000	99,640,000	6,712,000
Total		691,263	976,320			59,263,000

[1] Municipal water supply.
[2] Industrial water supply.
[3] Power.
[4] Air base water supply.
[5] Naval shipyard water supply.
[6] Drainage.
[7] Flood control.

I also submit a list of four projects on which rehabilitation work will be accomplished if funds are provided by appropriations.

Authorized rehabilitation work on existing projects

Project	Unit	Work involved	Total cost	Required, first year
Boise project, Idaho	Black Canyon Dam	Resurface downstream side of dam.	$300,000	$60,000
Middle Rio Grande, N. Mex.	Storage and distribution system, 84,876 acres.	Channel rectification drainage.	30,179,000	1,000,000
Owyhee project, Oregon-Idaho.	Storage and distribution system, 103,499 acres.	Gravel lining 40 miles of canal.	200,000	50,000
Vermejo project, New Mexico.	Storage and distribution 7,200 acres.	Reconstruction and enlargement of reservoirs.	2,679,000	500,000
OTHER PROJECTS OF THE BUREAU OF RECLAMATION				
Canadian River, Tex.	Storage and distribution of water to 11 cities.	Sanford Reservoir pumping plants and pipelines.	85,383,000	4,660,000
Central Valley, Calif.	Delta steam power plant	33,000 kilowatts for firming 615,000 kilowatts hydro power.	33,616,000	2,000,000

The construction and reconstruction, while recommended, will add only a little to our food supply.

I also submit for the record a list of proposed projects for which data has been furnished the committee, that will bring 832,040 acres

under irrigation and provide a supplemental supply for 2,350,200 acres of land.

Needed but unauthorized reclamation projects

	Irrigation		Power	Other benefits [1]	Cost	Feasibility report
	New	Supplemental				
	Acres	*Acres*	*Kilowatts*			
Anadarko, Okla	9,000			(2 3)	$15,360,000	In field.
Bitterroot, Mont	17,700	48,300			8,748,000	To Congress, February 1950.
Cambridge, Idaho	2,360				474,000	Do.
Canby, Oreg	3,270				961,000	Do.
Canton, Okla	16,000				4,671,000	Washington, Bureau of Reclamation.
Central Arizona		639,700	770,000	(1 3 6 7 8)	738,408,000	To Congress, September 1948.
Central Valley, Calif	200,000	1,000,000	113,000	(1)	95,708,000	To Congress, August 1949.
Supplement units:						
Kings River			70,000		78,060,000	To Congress, March 1950.
Trinity River	250,000		206,000		142,616,000	In field.
Collbran, Colo	2,310	18,340	7,400	(3)	13,299,000	Executive offices, Washington.
Colorado River storage	132,870	267,300	1,234,000	(1 6 7 8)	1,002,202,000	Sent to States for review.
Council, Idaho	1,650	2,560			1,960,000	To Congress, February 1950.
Crooked River, Oreg	9,900	10,220		(1 8)	5,278,000	Do.
Grand Coulee Dam				(1)	2,750,000	Do.
Gunison-Arkansas, Colo		322,000	104,800	(3 4 8)	147,440,000	In field.
Lower Nueces, Tex				(1 2 3 8)	38,829,000	Do.
Mann Creek, Idaho	270	4,030			1,949,000	To Congress, February 1950.
Missoula Valley, Mont		1,200			184,000	Do.
Paonia, Colo	2,210	14,830			6,191,000	In field.
Snake River, Idaho	192,000		1,020,000	(1 4)	610,234,000	To Congress, February 1950.
The Dalles (west unit) Oreg.	4,500				2,300,000	Do.
Upper Star Valley, Wyo		21,720		(3)	3,892,000	Do.
Vale (Bully Creek) Oreg	4,000			(1 8)	2,846,000	Do.
Total	832,040	2,350,200	3,525,200		2,924,360,000	

[1] Flood control.
[2] Industrial water supply.
[3] Municipal water supply.
[4] Navigation.
[5] Pollution abatement.
[6] River regulation.
[7] Salt or salinity control.
[8] Fish and wildlife benefits.

If we would move with utmost speed and complete all the projects now under construction, authorized and proposed, we will not be providing for our additional food requirements 10 years from today.

We have never been engaged in war when we were not short of food. We had some surpluses June 30, 1950, according to information in Senate Document No. 3 of the Eighty-second Congress. For example, 454,752 pounds of wool; 3,413,635 pounds of cotton, 161,649,213 pounds of butter.

In the last 6 months of 1950, the wool and butter surpluses have vanished and our cotton surplus is rapidly diminishing. The export of many agricultural products have been restricted or prohibited.

The report of the Preparedness Subcommittee of the Committee on Armed Services of the United States Senate, dated January 8, 1951, states:

> The fact that the United States has certain surpluses in some agricultural commodities has been well publicized. While the surpluses were accumulated through a purely domestic program—the price-support program of the Department of Agriculture—it is obvious that since the outbreak of the present emergency these surpluses have acquired new importance. Food supplies are fuel for any endurance struggle, and the struggle between west and east today may well be decided by the endurance of the competing economies. Conserved with caution and utilized with prudence, our agricultural surpluses might well be of enormous benefit to the endurance of our economy in the present struggle.
>
> Wool is not the only agricultural commodity in short supply. Cotton linters and perhaps long-staple cotton, by way of examples, are inadequate to our prospective preparedness needs.
>
> From two World Wars we have learned one vital fact about agriculture; during a period of semi- or total mobilization the demand for agricultural commodities, particularly foods and fibers, increases rapidly and progressively.

Somehow the people of the United States forget quickly. In World War II we stopped construction on many irrigation projects, which action only a few months later was reversed and construction again started at greater than original contract cost to the Government of the United States. If this action was found necessary in a 5-year war, how much more vital will the question of adequate food supply become in a defense and war period that may last 10 to 20 years or longer.

It, therefore, is a pleasure, Mr. Chairman, to compliment you and your comm .ttee on your initiative in asking the Bureau of Reclamation for reports [1]on its list of projects that are authorized and ready for construction and projects recommended for authorization.

In addition to data on authorized projects and projects for which feasibility reports have been submitted or will shortly be submitted to the Congress, data has also been submitted, covering the investigation program of the Bureau of Reclamation. This program must be kept going at full speed in order to reach determinations promptly regarding additional lands available for irrigation.

While it is not the responsibility of the committee to recommend appropriations for continuing our investigation program I am sure that most of its members will soon be appearing before the Interior Subcommittee of Appropriations. Therefore, I urge that you look over the details that have been submitted regarding the investigation program of the Bureau of Reclamation for your State and give your views to the appropriation committee on the amount that should be provided for continuation of the investigation program of the Bureau of Reclamation.

Mr. Chairman, I thank you for this opportunity of expressing my views regarding the urgency of continuing the programs of the Bureau of Reclamation, for both investigation of new projects and the prompt construction of projects already authorized.

The CHAIRMAN. We have a few minutes left.

Mr. RISING. May I make one more comment, Mr. Chairman.

The CHAIRMAN. Yes, Mr. Rising.

Mr. RISING. In this brochure that was presented to the committee entitled, the reclamation program for 1948–54, I notice on page 13 that the total area susceptible for irrigation in the United States is

37,960,000 acres, and that in 1947 the acreage under irrigation was 21,120,000 acres. There is left then a balance of 16,840,000 acres for which water is available to irrigate.

The program of the Bureau of Reclamation for the 6 years mentioned contemplated bringing a full water supply to 2,000,000 acres of that land, and supplemental water to 3,610,000 acres.

Now, the entire acreage proposed to be benefitted by the Bureau of Reclamation in that 6-year period would be just about enough land to take care of the additional food supply required by the increasing population for 1 year.

I also, Mr. Chairman, received a western paper this morning in which I found a clipping entitled "Huge Butter Surplus Now Disappearing." It is from the Great Falls Tribune of February 7. I would like to submit that for the record.

The Chairman. All right.

(The information referred to is as follows:)

[From the Great Falls Tribune, February 7, 1951]

HUGE BUTTER SURPLUS NOW DISAPPEARING

WASHINGTON, February 6.—That butter surplus which was turning official hairs gray a few months ago soon may turn into a shortage.

By last fall, the Agriculture Department had bought and stored up nearly 200,000,000 pounds of butter which could not be sold to the buying public at producer prices of about 60 cents a pound.

Now most of that butter has been eaten up and officials say there may be an over-all shortage before spring, when production normally increases.

This abrupt change in the situation largely reflects a growing consumer demand for more butter. Officials said they believe this increased demand reflects an increase in the amount of money many consumers have for food buying.

This larger buying power was said to be flowing from stepped-up employment and higher wages resulting from the defense program.

The disappearance of the Government stocks has been accompanied by advancing prices.

The Department said reserve supplies declined three times as much in December as in the same month of 1949 and five times as much in January of this year as last.

Mr. RISING. That is all.

The CHAIRMAN. I fear we won't have time to start in on questions.

We may expect you to appear before us some other time, and we will be glad to defer questions now, Mr. Rising.

Mr. RISING. Thank you.

The CHAIRMAN. While this doesn't complete to my mind the comprehensive study that I wanted the committee to have before bills are introduced, it will have to suffice, I think.

Mr. D'EWART. We do not meet tomorrow.

The CHAIRMAN. We do not meet tomorrow. The committee stands adjourned until the call of the Chair or until our next regular meeting.

(Whereupon, at 12:01 p. m. the committee adjourned.)

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